DOCUMENT RESUME

ED 295 803 SE 049 177

AUTHOR Jankowski, John E., Jr.
TITLE National Patterns of Science and Technology Resources: 1987. Surveys of Science Resources Series.
INSTITUTION National Science Foundation, Washington, D.C. Div. of Science Resources Studies.
REPORT NO NSF-88-305
PUB DATE Jan 88
NOTE 88p.; Charts, graphs, and small print may not reproduce well.
AVAILABLE FROM National Science Foundation, Forms & Publications Unit, 1800 G Street, NW, Washington, DC 20550 (free while supply lasts).
PUB TYPE Reports - Descriptive (141) -- Statistical Data (110)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS College Mathematics; College Science; *Economic Factors; *Employment Patterns; Engineering Education; Engineers; *Government Role; Higher Education; Mathematics Education; *Research and Development; *Science Education; Scientists; Secondary Education; Secondary School Mathematics; Secondary School Science; Technological Advancement
IDENTIFIERS *National Science Foundation

ABSTRACT

The dual concerns of economic competitiveness and national security have provided the main impetus behind the continued growth in support for research and development (R&D) by both government and industry. The funding of science and technology is a major factor behind capital and labor productivity increases. This report presents a summary of comprehensive measures of the financial and human resources that sectors of the U.S. economy devote to scientific and technological activities. Areas discussed include: (1) "R&D Expenditures"; (2) "Scientists and Engineers"; (3) "R&D Trends and the National Economy"; (4) "R&D Performance"; (5) "Research and Development by National Objective"; (6) "The Federal R&D Funds/Total Budget Funds Ratio"; (7) "The R&D/GNP Ratio"; (8) "Basic Research, Applied Research, and Development"; (9) "Basic Research"; (10) "Applied Research"; (11) "Development"; (12) "Full-Time Equivalent (FTE) R&D Scientists and Engineers"; (13) "International Comparisons"; (14) "Employment Trends"; (15) "S/E Labor Market Balance"; (16) "Sectoral Patterns and Trends"; (17) "Doctoral Scientists and Engineers"; (18) "Foreign Citizen Participation"; (19) "S/E Pipeline"; (20) "Precollege Science and Mathematics"; (21) "S/E Degree Production"; (22) "Entry to the S/E Labor Market." Appendices include technical notes and detailed statistical tables. (CW)

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National Science Foundation, National Patterns of Science and Technology Resources: 1987 (NSF 88–305) (Washington, D.C., 1988).

foreword

The dual concerns of economic competitiveness and national security have provided the main impetus behind the continued growth in support for research and development by both Government and industry. Additionally, the Nation's funding of science and technology is a major factor behind recent capital and labor productivity increases. Credit for these improvements in the economy and the ability to compete effectively in international markets must be shared by all sectors of the Nation's economy—government, industry, academia, and other nonprofit institutions. The National Science Foundation, in attempting to monitor the health of U.S. science and technology, assembles and analyzes comprehensive measures of the financial and human resources that each of these sectors devotes to scientific and technological activities. This annual report presents a concise but comprehensive summary of such information.

This publication complements the National Science Board's *Science Indicators* and *Science and Engineering Personnel: A National Overview* developed by this Division. The 1987 data presented in this current report reflect estimates for research and development programs contained in the Federal 1988 budget.

The Division of Science Resources Studies, responsible for the generation of this and other reports, continues to seek suggestions for their improvement from the user community. Comments on possible improvements will be greatly appreciated and will help in the development of future reports.

William L. Stewart
Director, Division of Science
Resources Studies
Directorate for Scientific,
Technological, and
International Affairs

January 1988

acknowledgments

This report was prepared by John E. Jankowski, Jr., Science Resources Analyst, Economic Analysis Studies Group.

Supervision, review, and guidance were provided by John R. Chirichiello, Study Director, Economic Analysis Studies Group, Leonard L. Lederman, Head, Special Analytical Studies Section, Charles H. Dickens, Head, Surveys and Analysis Section, and William L. Stewart, Director, Division of Science Resources Studies.

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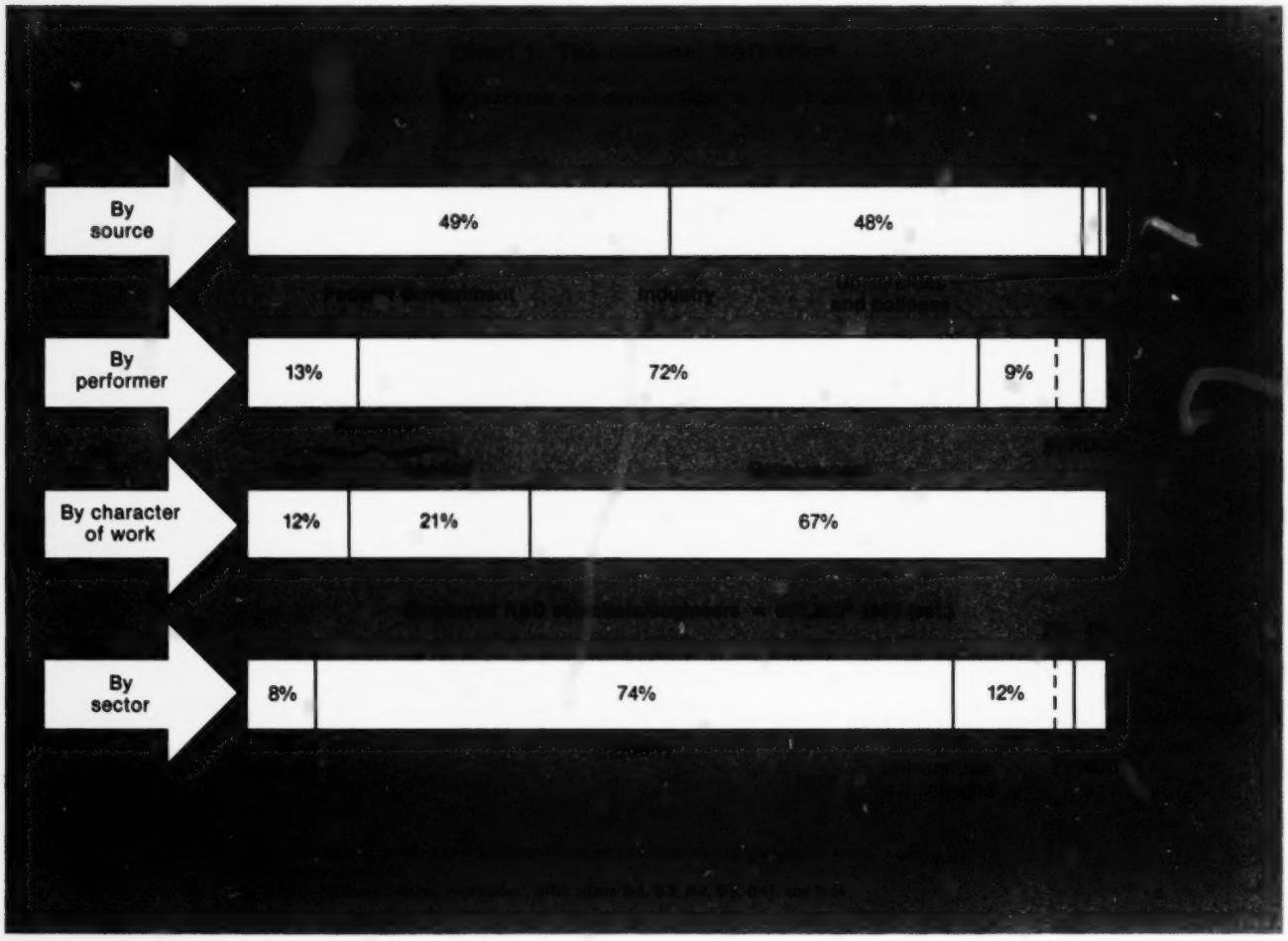
summary

r&d expenditures

The Nation is expected to spend $123.1 billion on research and development in 1987 (chart 1). This amount is 7 percent more than was spent in 1986, or 4 percent more after adjustment for inflation.[1] The Federal Government is expected to provide $60.4 billion (9 percent growth from 1986) and industry support is estimated at $58.6 billion (5 percent growth); combined, these two sources provide about 97 percent of the national research and development (R&D) total. Universities and colleges are expected to provide $2.7 billion in 1987 (8 percent growth from 1986). In absolute dollars, Federal R&D expenditures are expected to grow by $5.1 billion; industry expenditures by $3.0 billion; and universities and colleges expenditures by $0.2 billion. These 1987 estimates represent a continuation in a 12-year pattern of expanding real R&D growth.

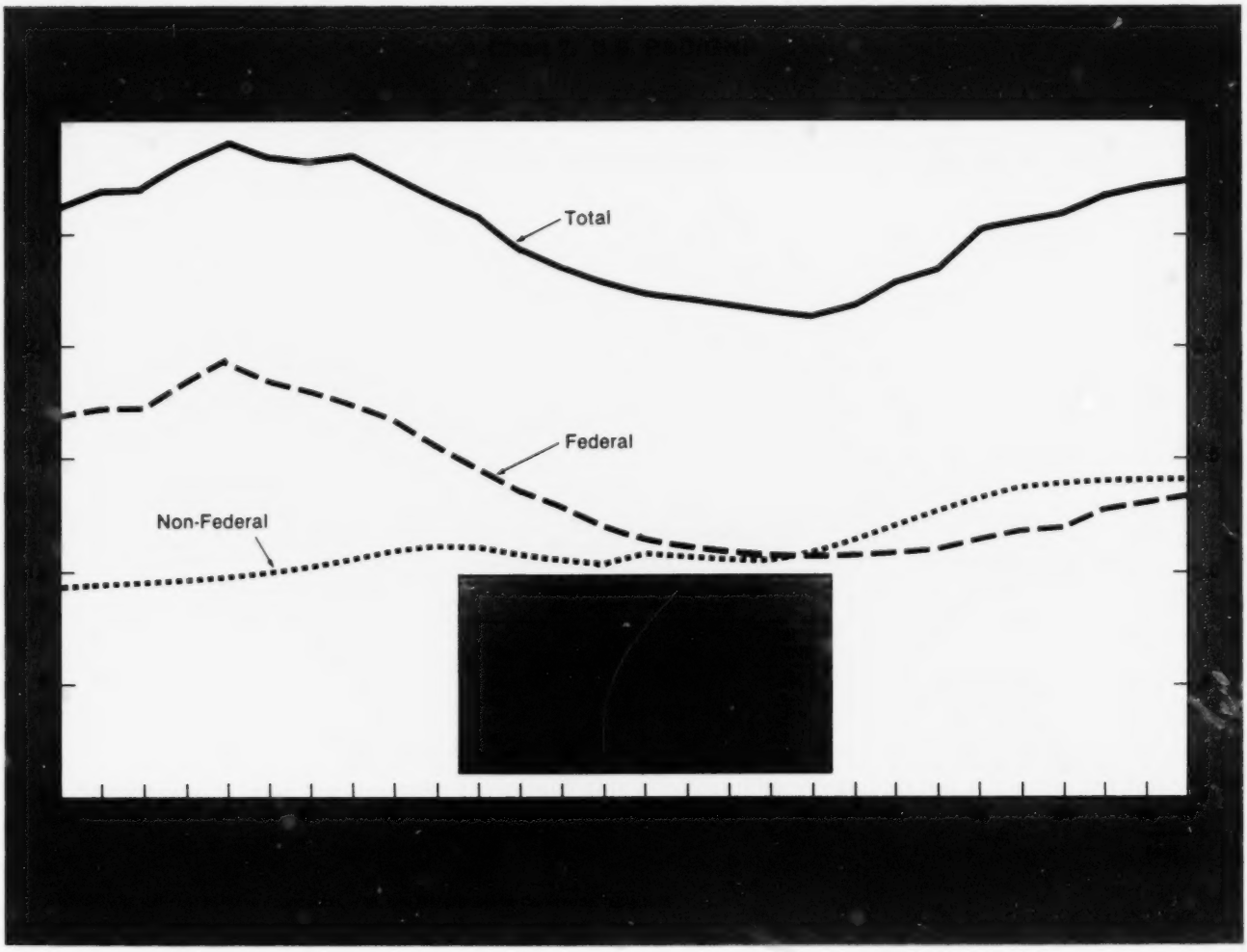
[1]In the absence of a reliable R&D cost index, the implicit price deflator for the gross national product (GNP) is used to convert R&D expenditures to constant 1982 dollars. The GNP deflator includes the effects of price changes for all final goods and services in the economy; therefore, it can indicate only approximate changes in the cost of inputs specifically related to R&D performance.



Between 1968 and 1975, real R&D funding fell almost annually; overall, such expenditures were down 9 percent. Then, following recovery from the 1974 oil embargo and 1975 recession, a significant funding reversal occurred. R&D expenditures in the United States more than doubled within just 6 years, jumping from $39 billion in 1976 to $79 billion in 1982. When adjusted for inflation, this 6-year increase was about 28 percent. Initially, the primary R&D emphasis by both Federal and non-Federal sources was on nondefense activities such as efficient energy use and pollution abatement. In 1981, however, Federal R&D support began to shift toward defense. Industry R&D expenditures on energy and pollution abatement also slowed, increasing during 1981 and 1982, for example, at only one-third the rate reported for the previous 4 years.

Overall, constant-dollar R&D expenditures between 1980 and 1986 increased at an average annual rate of 5.4 percent, compared to a 4.1-percent average annual growth for the 1975–80 period. Real R&D growth slowed to 4 percent in 1986—which is also the rate of increase estimated for 1987. Most R&D growth in the eighties has been fueled by major increases in Federal support for defense-related R&D programs—up about 80 percent in real terms since 1980. There also is evidence that the Economic Recovery Tax Act (ERTA) of 1981 began to have a small but positive effect on R&D spending across a number of industries during 1981 and beyond. ERTA offered U.S. companies an incentive to increase domestic R&D spending by providing a 25-percent tax credit for incremental R&D expenditures made between July 1, 1981, and December 31, 1985. The Tax Reform Act of 1986 extended the R&D tax credit through 1988, although at a reduced rate of 20 percent.

The proportion of gross national product (GNP) spent on R&D activities has increased each year since 1978, growing from 2.1 percent to an estimated 2.7 percent in 1986 (chart 2). During this 8-year period, national R&D spending increased at an average annual constant-dollar rate of 5.2 percent compared with a 2.2-percent rate of



growth for the Nation's GNP. The estimated 1987 R&D/GNP ratio, though essentially level with that for 1986, is at the highest point since 1968.

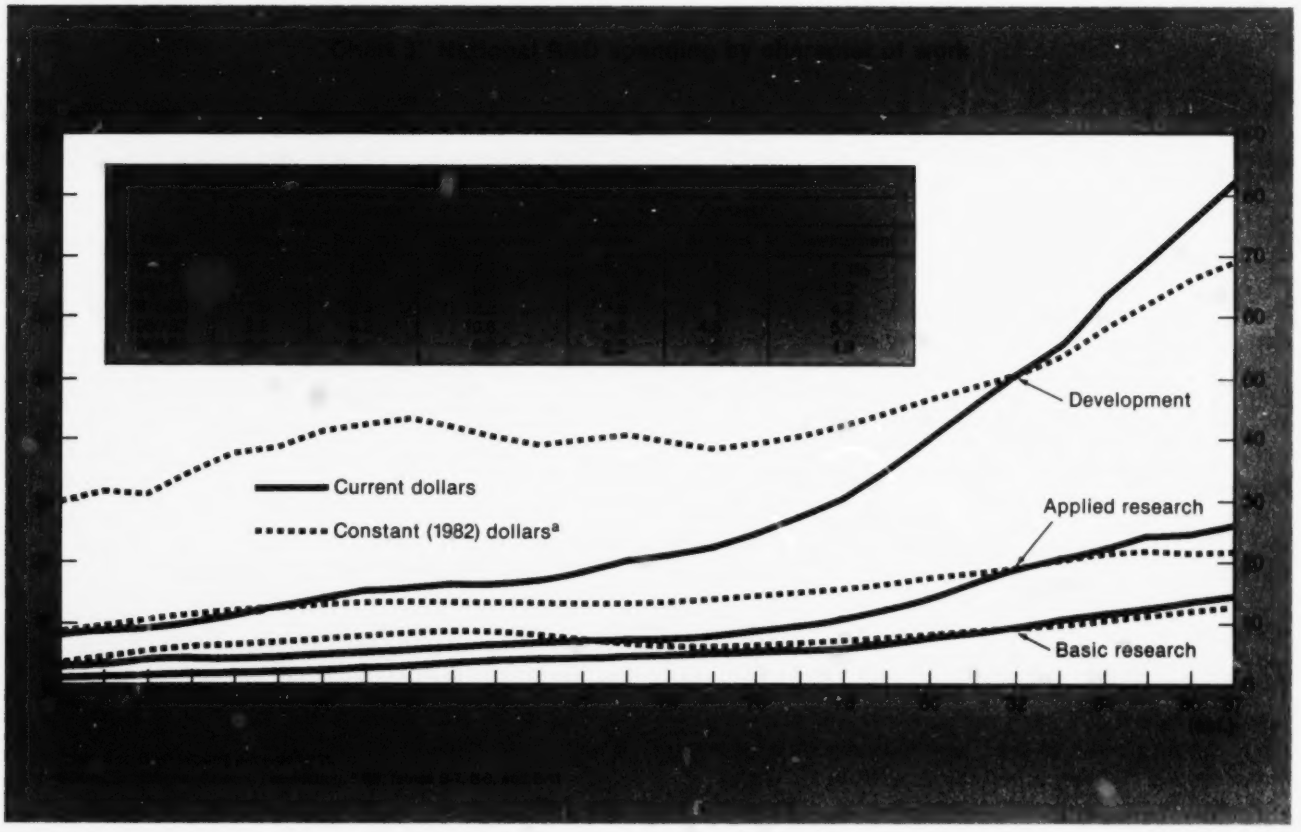
The United States spends more money annually on R&D activities than any other nation; it also spends more than France, West Germany, the United Kingdom, and Japan combined. As a proportion of GNP, U.S. R&D expenditures are comparable to those of Japan (2.8 percent) and West Germany (2.7 percent). The R&D/GNP ratios of France (2.4 percent) and the United Kingdom (2.2 percent) are close behind. However, when only civilian (nondefense) R&D expenditures are compared to GNP, the U.S. ratio (1.8 percent) is substantially lower than that of Japan (2.8 percent) and West Germany (2.6 percent). The nondefense R&D/GNP ratios in France and the United Kingdom are 1.9 percent and 1.5 percent, respectively.

In 1986, the Federal Government was the source of 49 percent of total R&D expenditures in the United States—the first time since 1979 that the Federal share of R&D support exceeded that provided by industry. The 1986 Federal total of $55.3 billion was 8 percent higher than that of 1985 (5 percent higher in real terms). Estimates for 1987 show a 9-percent increase in Federal R&D support (to $60.4 billion), or 6 percent after adjustment for inflation. Defense spending is expected to primarily contribute to this growth, although R&D support for health and space also is increasing.[2] Federal funds for research and development are estimated at 7 percent of total fiscal year 1987 budget authorizations: 14 percent of Federal defense funds are for research and development, compared to 3 percent of total nondefense authorizations.

Non-Federal R&D spending is expected to increase 6 percent in both 1986 and 1987, and should reach $62.7 billion in the latter year. In real terms, the increases are estimated at 3 percent for 1986 and 2 percent for 1987.

In 1986, the research portion of national R&D spending amounted to an estimated $38.9 billion—34 percent of the total. This was 3 percent above the 1985 level (0.5 percent in real terms). Basic research spending was up an estimated 5 percent in real terms, whereas estimated applied research spending fell 2 percent in 1986 after adjusting for inflation. Development spending amounted to $75.8 billion or 66 percent of R&D expenditures, 9 percent more than in 1985 (6 percent in real terms). These increases were in keeping with long-term growth trends for both total R&D spending (chart 3). The expected 1987 increases are 6 percent for basic research, 5 percent for

[2]Office of Managment and Budget, "Special Analysis J," *The Budget of the United States Government, Fiscal Year 1988* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1987.)



applied research, and 8 percent for development. These represent real-term increases of about 2 percent each for basic and applied research, and 5 percent for development. The higher growth rate for development reflects intensified defense R&D spending (90 percent of which is development) by the Federal Government as well as a shift in industry's commitment to development over applied research efforts.

Even though the Federal Government increasingly emphasizes development, especially in the defense area, it continues to support two-thirds of the Nation's basic research. This rather high ratio has remained virtually unchanged since the early sixties. One-half of the Government's basic research total supports activities at the Nation's universities and colleges.

In 1987, the Federal share of total national support for applied research is estimated at 43 percent. Industry provides more than one-half of the support for, and performs two-thirds of, the Nation's applied research.

Federal support of development is expected to reach 48 percent ($39.4 billion) of the national total; industry support is estimated at 52 percent ($42.3 billion) of all development expenditures. In 1987, industry is expected to account for 84 percent of the Nation's total development performance, while Federal intramural laboratories should spend 12 percent of the Nation's development funds. Industrial laboratories are expected to receive 37 percent of their development funds from Federal agencies.

scientists and engineers

The United States relies heavily on its scientific and technological base for economic growth, national security, and international competitiveness. The increasing technological sophistication of the U.S. workforce evidences the essential role played by science and engineering (S/E) personnel in supporting that base. In 1986, there were about 2.4 million engineers and 2.2 million scientists employed in the United States. Of these 4.6 million, 85 percent—3.9 million—were engaged in S/E activities. Between 1976 and 1986, the employment of scientists and engineers grew at a combined annual rate of 7.1 percent. This growth occurred despite two recessions that adversely affected U.S. economic performance at the beginning of the eighties. During this 10-year period, employment of scientists and engineers increased more than three times as fast as total U.S. employment and about twice as fast as professional employment. The rapid increase in S/E personnel growth was primarily in response to growth in R&D expenditures; the pace of technological change, especially as it related to computer and electronics applications; and the need to increase productivity by improving U.S. manufacturing technology. As a result, S/E employment as a share of the U.S. employed civilian workforce rose from 2.6 percent in 1976 to 4.2 percent in 1986. The proportion of the U.S. workforce actually engaged in S/E jobs was 3.5 percent in 1986.

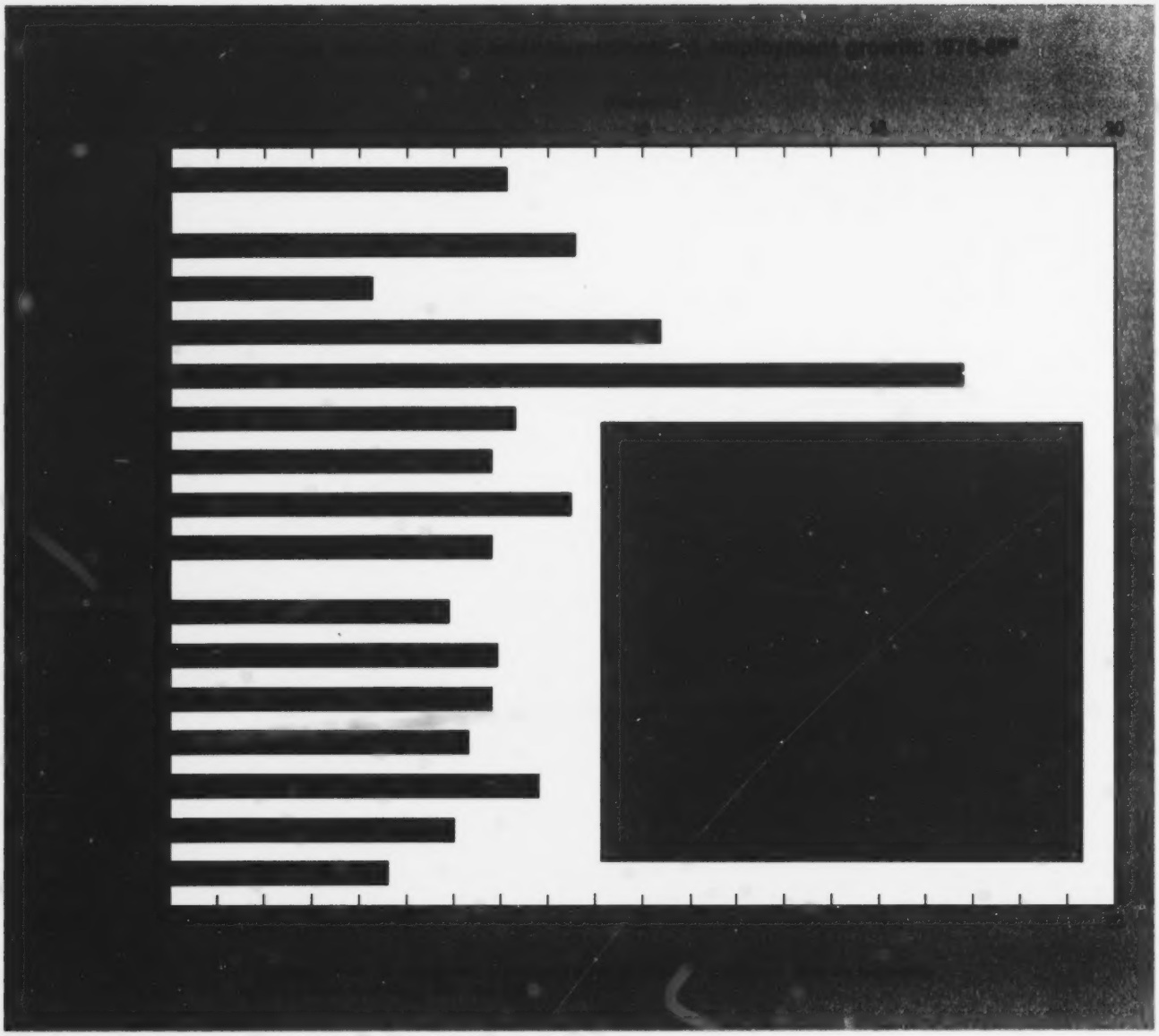
Although women made significant employment gains during the 1976–86 period, they continued to be underrepresented in science and engineering. In 1986, women accounted for 15 percent of total employed scientists and engineers—27 percent of all scientists and 4 percent of all engineers. In contrast, women comprised about 44 percent of the overall U.S. workforce and 43 percent of all professional employment. Between 1976 and 1986, employment of women scientists and engineers grew at an average annual rate of 13.3 percent. There is some indication that their rate of S/E employment growth has been slowing in recent years.

Minority groups (racial and ethnic) differ from each other with respect to their representation within the S/E workforce: blacks and Hispanics are underrepresented in S/E fields, whereas Asians' S/E employment share is much higher than their total workforce share.

S/E employment growth varies significantly between scientists and engineers and among various S/E fields. During the 1976–86 period, employment of scientists (including computer specialists) increased more rapidly than that of engineers, growing at annual rates of 8.6 percent and 5.9 percent, respectively (chart 4). (There is some indication that the slower rate of engineering growth may have resulted partially from supply constraints.) Computer specialties was the fastest growing science field, accounting for more than one-third of the total increase among scientists. Among engineering fields, employment of electrical/electronics engineers grew fastest. Together with mechanical engineering, this field accounted for almost one-half of the total 1976–86 job expansion for engineers.

Scientists and engineers report involvement in a variety of work activities. In 1986, for example, employed S/E personnel reported that they were engaged more in R&D activities (36 percent) than in any other type of work. Basic research accounted for 3 percent of primary work activities reported, applied research for 6 percent, development for 19 percent, and R&D management for 9 percent. Scientists and engineers were equally likely to have jobs in non-R&D management, accounting for about one-fifth of their respective 1986 primary work activity totals. By broad category, engineers were most likely to be employed in either development or production and related activities (including quality control). Scientists were most likely to be employed in research, teaching, or the combination of activities related to reporting, computing, and statistical work.

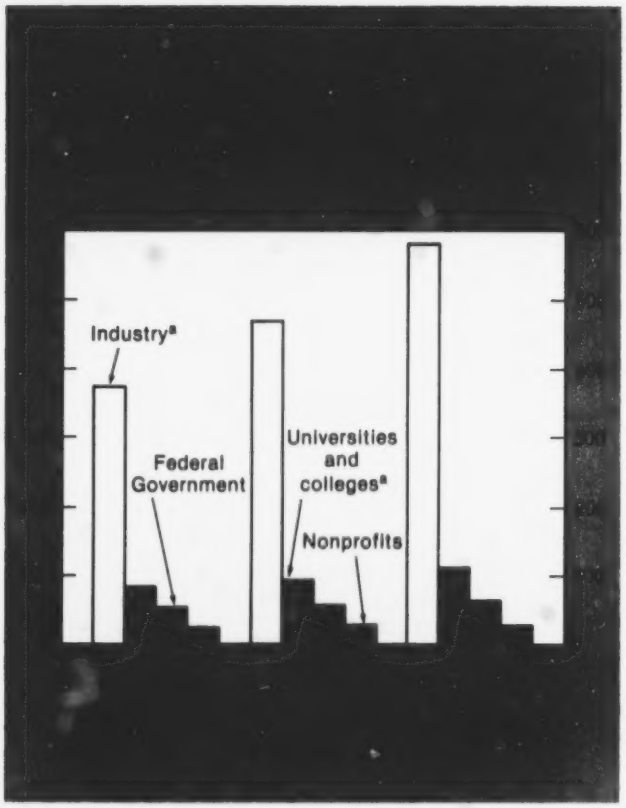
According to institutional performer-based surveys, the full-time equivalent of 802,300 scientists and engi-



neers were estimated to be employed on R&D activities in 1986. This is an increase of 4 percent over 1985 and about 50 percent over 1976; most of the growth occurred in the industrial sector (chart 5).

Industry and academia showed the strongest S/E employment growth between 1976 and 1986. The 8.0-percent average annual growth in industrial employment during this period raised industry's S/E employment share to two-thirds (3.1 million) of the total. Traditionally the major employer of U.S. engineers, industry is now—because of the rapid growth in demand for computer specialists—the primary employer of U.S. scientists as well. Academia, which in 1986 employed 14 percent (627,000) of S/E personnel, recorded 8.1 percent annual growth since 1976. Nearly 8 percent (354,000) of the S/E workforce is employed by the Federal Government; 5 percent (241,000) is employed by other levels of government. The relatively slow (5.2 percent) annual growth in total government S/E employment may have resulted, in part, from (1) the restrained growth in total Federal employment at the beginning of the eighties and (2) the slower growth in government engineering salaries as compared to those offered by industry.

Since the beginning of the eighties, the number of S/E baccalaureates has increased substantially, rising from 292,000 in 1980 to 324,000 in 1986. During this period, there was a significant shift in field distribution favoring engineering and computer science. Undergraduate degree production in both life and social sciences, however, declined substantially.



The number of master's and doctoral S/E degrees awarded in the United States also has increased significantly since 1980. In 1986, 62,500 master's and 18,800 doctoral degrees in S/E fields were awarded; these totals were up 15 percent and 9 percent, respectively, from 1980. The greatest increases in graduate level S/E degree production have been in computer science, physical sciences, and engineering fields.

Foreign student participation in U.S. S/E graduate degree programs has been increasing steadily. For example, in 1986, foreign students on temporary or permanent visas received 23 percent of doctorate degrees awarded in science, and 55 percent in engineering. In 1980, foreign student shares of S/E doctorates were 17 percent and 48 percent, respectively. After graduation, about one-half of foreign-student doctorate recipients have stated their intent to remain in the United States to pursue postdoctoral study or obtain employment.

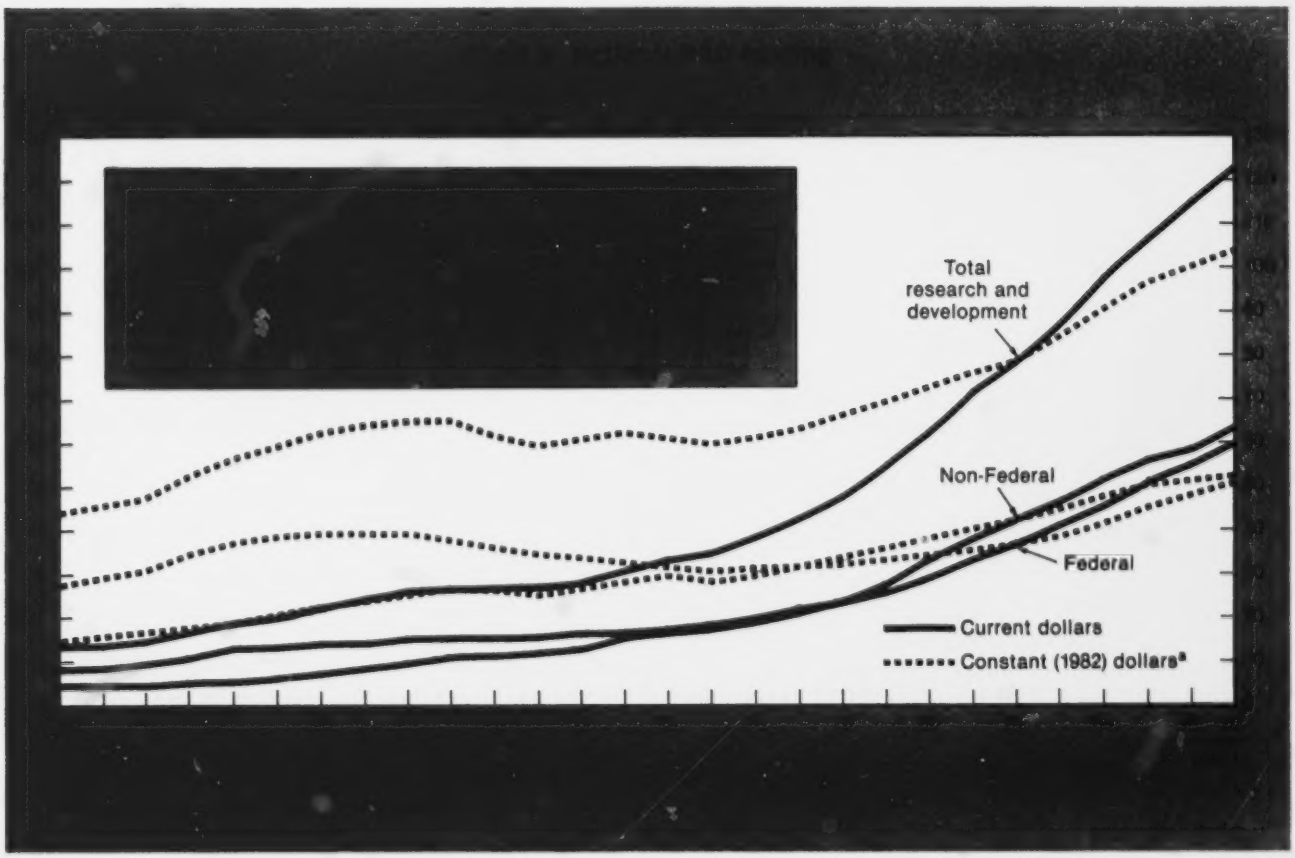
During the 1975–85 decade, employment growth of S/E doctorate-holders in the United States averaged 4.6 percent per year. The number of employed doctoral scientists has continued to outnumber doctoral engineers by five to one despite a relatively higher rate of growth in the number of engineering doctorates awarded. Within the sciences, differential growth rates have resulted in changing field distributions favoring computer specialists, social scientists, and psychologists. Within engineering, the highest rate of employment growth was reported for doctoral aeronautical/astronautical engineers, while the greatest absolute growth was in the number of employed Ph.D. electrical/electronics engineers. Between 1975 and 1985, there were three notable changes in employment characteristics of doctoral scientists and engineers: (1) teaching declined as a work activity in academia as more emphasis was placed on basic and applied research; (2) a high proportion of doctoral employment shifted to private industry (growing from about 25 percent in 1975 to more than 30 percent in 1985); and (3) an increasing share of S/E doctorate-holders were working in non-S/E jobs (9 percent in 1985, up from 6 percent in 1975).

national perspectives of r&d resources

r&d trends and the national economy

An estimated $114.7 billion was spent on U.S. research and development in 1986 by four principal sectors of the economy—Federal Government, industry, universities and colleges, and other nonprofit institutions (chart 6). This was a 7-percent increase from 1985 levels, or a 4-percent increase in constant dollars. In 1987, total R&D spending is expected to increase an additional 7 percent, or 4 percent in real terms.[3] This would be the twelfth

[3]Real growth for 1987 is derived by using the Office of Management and Budget GNP implicit price deflator estimate of 3.3 percent.

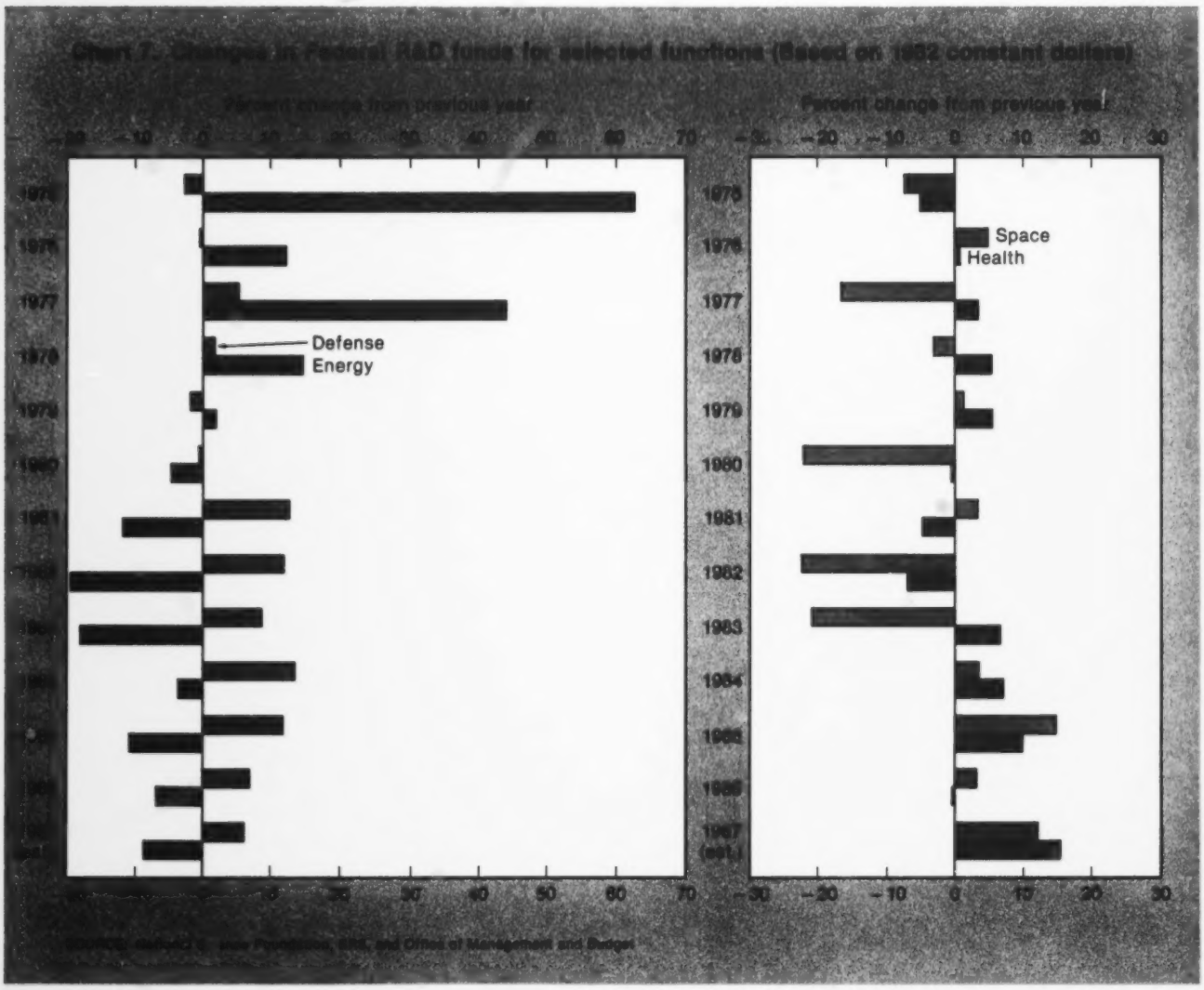


consecutive year of real-term increases in national R&D expenditures.

From 1967 until the late seventies, R&D growth had not kept up with overall increases in the economy: for nearly a decade, there had been no real growth in national R&D funding. Following the 1974 oil embargo and the 1975 recession, however, this situation ended as the Nation's R&D effort began a period of strong real-term growth that was heavily influenced by the search for solutions to the energy problem.

Between 1975 and 1980, national R&D expenditures grew at an average annual constant-dollar rate of 4.1 percent. During this period, non-Federal R&D support increased at three times the rate of Federal R&D support (6 percent annually versus 2 percent). Non-Federal increases were concentrated in industry, and largely resulted from greater emphases on energy conservation and improved use of fossil fuels. Additionally, Federal policies concerning regulations and minimum standards—particularly in such areas as food and drug production, environmental pollution, and public safety—served to increase and redirect industry R&D spending. Federal R&D increases, while partly the result of continuing defense expenditures, were largely attributable to the emphasis on energy-related research and development—particularly nuclear energy development—and to greater support for health-related research and development (chart 7).

Since 1980, Government R&D efforts have shifted primarily toward defense, which now accounts for 69 percent ($40.3 billion) of all Federal R&D expenditures. In fact, between 1980 and 1987, 90 percent of the increase in Federal R&D support is attributable to defense activities. Since 1983, Government R&D expenditures on both



health and space also have increased almost annually (chart 7). In 1987, for example, $6.6 billion is expected to be spent on Federal R&D health programs; 89 percent of this is to support biomedical research conducted by the National Institutes of Health (NIH). Federal support for health research and development is now second only to its support for defense-related research and development.[4]

In addition to increases in direct Federal support for research and development, there have been other Federal efforts to stimulate national R&D spending in the eighties. In 1981, for example, ERTA was passed. This Act provided additional tax credits to those companies that increased their R&D expenditures through calendar year 1985. Judged to have had at least moderate success in fostering industry research and development, the R&D credit provisions were extended through December 31, 1988, by the Tax Reform Act of 1986—although at a slightly reduced rate (20 percent, down from 25 percent) and for a somewhat narrowed and stricter definition of qualified research and development.

Concurrent with gains in Federal R&D spending, the private sector also has increased its R&D efforts, with spending up 38 percent—or $13.6 billion (constant 1982 dollars)—from 1980 levels. Non-Federal (largely industry) R&D support has increased in real terms at an average annual rate of 4.7 percent between 1980 and 1987. These R&D increases probably stem from both a growing perception of foreign competition in high-technology industries[5] and increased R&D spending by such defense-related industries as those manufacturing aircraft and missiles. Again, a small part of the increase in industry R&D spending may derive from the positive impact of ERTA and its successor.

The current 12-year growth pattern of industry R&D support has been both strong and durable. This is reflected by its survival through both the mild 1980 recession and the deeper 1982 recession. However, more recent data indicate a slowing in company funding of R&D activities through 1987 and beyond. Concern about future overall economic conditions; uncertain company sales and profit expectations; and the restructuring of R&D efforts after the recent large number of corporate takeovers, mergers, and reorganizations have all been cited as factors contributing to the probable slowing in the rate of industry's real R&D funding efforts.

r&d performance

R&D performance by industry—including that performed by those federally funded research and development centers (FFRDCs) administered by industrial firms—accounts for 73 percent of the national R&D effort. In 1987, this sector is expected to expend $89.2 billion on R&D activities, an increase of 7 percent over the 1986 level of $83.6 billion, or a 3-percent increase in real terms (table 1 and chart 8).[6] Federal funds for research and development performed by industry are expected to increase by $2.8 billion; company-financed R&D performance, by $2.9 billion. Overall, the Federal Government is expected to fund about 36 percent of industry R&D performance in 1987.

In the late sixties, the Federal Government provided more than one-half the money spent by industry for R&D performance. By the midseventies, however, the Federal share had decreased to about 35 percent of the industry total. This decrease reflected Federal cutbacks in defense and space programs as well as the continued growth in R&D funding by industry itself. The Federal share continued to decline in the last half of the seventies, but at a slower rate, partially because of the new Federal emphasis on energy R&D programs. Between 1975 and 1980, company R&D funding increased at 2.5 times the constant-dollar rate of Federal R&D funds to industry (6.2 percent annually versus 2.4 percent); by 1980, the Federal share of industry R&D funding bottomed out at 31.5 percent. Since then, company funds for industry R&D performance have grown at an average annual constant-dollar rate of 4.6 percent; Federal R&D funds to industry—largely for defense but also for space and other nondefense programs—have increased 7.3 percent annually.

The Federal Government is historically the second largest R&D performer in the Nation, annually accounting for about 12 percent of U.S. R&D performance between 1980 and 1986. In 1987, its share is expected to increase slightly to 13 percent of the national R&D total, or $15.5 billion. This represents an increase of 14 percent from 1986 in current dollars, or 11 percent in constant dollars (chart 8).

Between 1970 and 1982, Federal intramural R&D performance in real terms remained relatively flat, as Federal R&D performance decreased from 16 percent of the national total to an estimated 12 percent. This relative reduction in Federal R&D performance was caused largely by cutbacks in space R&D programs. For example, between 1970 and 1982, National Aeronautics and Space

[4]National Science Foundation, *Federal R&D Funding by Budget Function: Fiscal Years 1986–88* (NSF 87-305)(Washington, D.C., March 1987).

[5]For example, data from the International Trade Administration show that in 1986 the United States imported more high-technology products ($75.1 billion) than it exported ($72.5 billion). This was the first time that the United States had experienced a trade deficit in high-technology products.

[6]Industry R&D price deflators developed by Professor Edwin Mansfield of the University of Pennsylvania indicate that the GNP implicit price deflator may overstate real R&D spending by about 1 percent per year. ("Price Indexes for R and D Inputs, 1969–1983," *Management Science*, Vol. 33, No. 1, January 1987, pp. 124–129.)

Table 1. Intersectoral transfers of funds used for performance of research and development, basic research, applied research, and development: 1987 (estimated)

RESEARCH AND DEVELOPMENT[1]

[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[2]	Universities and colleges[3]	Associated FFRDCs[4]	Other nonprofit institutions[2]		
Federal Government	15,450	31,700	7,000	3,800	2,400	60,350	49.0
Industry	—	[5]57,500	670	—	400	58,570	47.6
Universities and colleges	—	—	2,700	—	—	2,700	2.2
Other nonprofit institutions	—	—	780	—	650	1,430	1.2
Total	15,450	89,200	11,150	3,800	3,450	123,050	100.0
			14,950				
Percent distribution, performers	12.6	72.5	9.1	3.1	2.8	100.0	
			12.1				

BASIC RESEARCH[1]

[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[2]	Universities and colleges[3]	Associated FFRDCs[4]	Other nonprofit institutions[2]		
Federal Government	2,220	600	4,920	1,200	730	9,670	64.7
Industry	—	[5]2,400	390	—	180	2,970	19.9
Universities and colleges	—	—	1,600	—	—	1,600	10.7
Other nonprofit institutions	—	—	460	—	250	710	4.7
Total	2,220	3,000	7,370	1,200	1,160	14,950	100.0
			8,570				
Percent distribution, performers	14.8	20.1	49.3	8.0	7.8	100.0	
			57.3				

[1]All data are estimated from reports by performers.

[2]Expenditures for federally funded research and development centers (FFRDC's) administered by both industry and by nonprofit institutions are included in the totals of their respective sectors. They are estimated to account for less than 5 percent and 25 percent, respectively, of the industry and nonprofit institutions performance totals. FFRDCs are organizations exclusively or substantially financed by the Federal Government to meet a particular requirement or to provide major facilities for research and training purposes.

Table 1. Intersectoral transfers of funds used for performance of research and development, basic research, applied research, and development: 1987 (estimated)—Con.

APPLIED RESEARCH[1]

[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[2]	Universities and colleges[3]	Associated FFRDCs[4]	Other nonprofit institutions[2]		
Federal Government	3,315	4,600	1,685	1,100	600	11,300	43.4
Industry	—	[5]12,950	205	—	135	13,290	51.1
Universities and colleges	—	—	910	—	—	910	3.5
Other nonprofit institutions	—	—	280	—	230	510	2.0
Total	3,315	17,550	3,080	1,100	965	26,010	100.0
			4,180				
Percent distribution, performers	12.7	67.5	11.8	4.2	3.7	100.0	
			16.1%				

DEVELOPMENT[1]

[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[2]	Universities and colleges[3]	Associated FFRDCs[4]	Other nonprofit institutions[2]		
Federal Government	9,915	26,500	395	1,500	1,070	39,380	48.0
Industry	—	42,150	75	—	85	42,310	51.1
Universities and colleges	—	—	190	—	—	190	.2
Other nonprofit institutions	—	—	40	—	170	210	.3
Total	9,915	68,650	700	1,500	1,325	82,090	100.0
			2,200				
Percent distribution, performers	12.1	83.6	.9	1.8	1.6	100.0	
			2.7				

[3]Includes agricultural experiment stations.
[4]Federally funded research and development centers (FFRDCs) administered by individual universities and colleges and by university consortia.
[5]Includes State and local government funds.
SOURCE: National Science Foundation, SRS

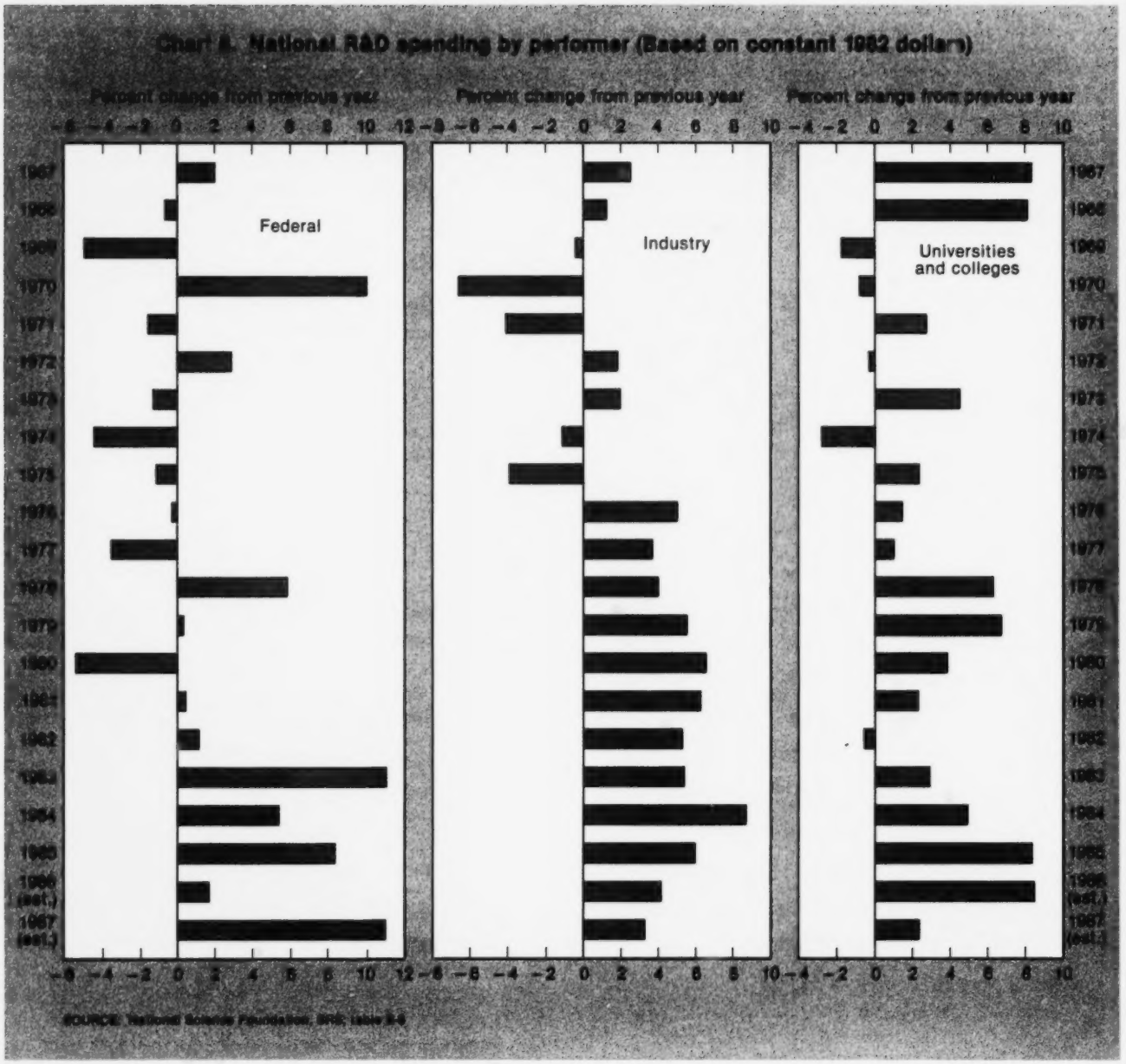


Chart 6. National R&D spending by performer (Based on constant 1982 dollars)
Percent change from previous year
Federal
Industry
Universities and colleges
SOURCE: National Science Foundation, SRS, table B-6

Administration (NASA) funds for intramural R&D performance decreased by more than one-half in real terms. Since 1983, however, real-term increases in Federal defense spending have kept the Federal intramural share of national R&D expenditures at 12 percent.

In 1987, the Department of Defense (DOD) is expected to have a 15-percent increase in intramural R&D expenditures, to $10.2 billion.[7] All other Federal agencies are expected to spend $5.2 billion on intramural research

[7]Estimates are for fiscal year 1987 Federal intramural obligations, and cover costs associated with planning and administering intramural and extramural R&D programs by Federal personnel as well as actual intramural R&D performance. National Science Foundation, *Federal Funds for Research and Development: Fiscal Years 1986, 1987, and 1988*, Volume XXXVI (Detailed Statistical Tables)(NSF 87-314)(Washington, D.C., 1987).

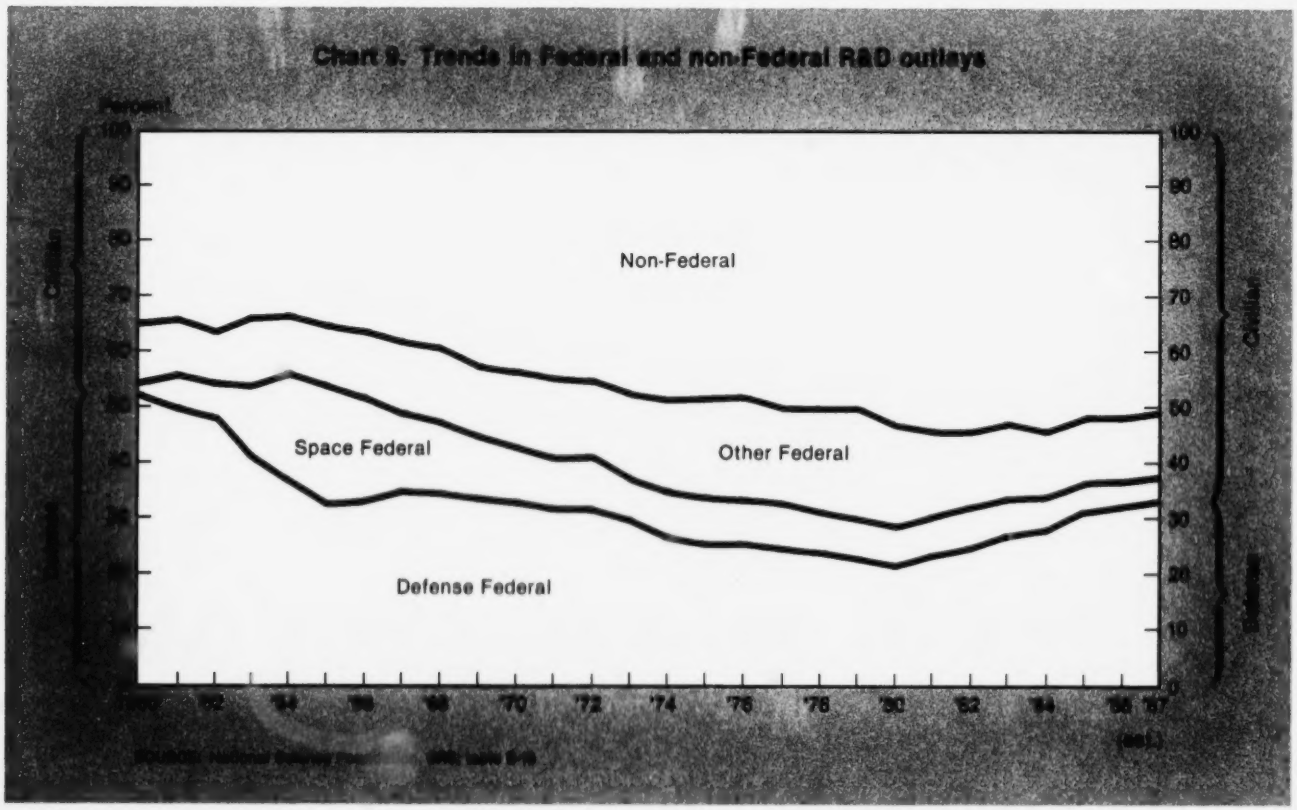
and development, which is a 12-percent increase over 1986 levels. Of nondefense Federal agencies, only NASA ($1.5 billion) and NIH ($1.1 billion) are expected to spend more than $1 billion. These represent increases of 20 percent and 11 percent, respectively, from 1986 intramural R&D expenditures.

Universities and colleges (excluding academically administered FFRDCs) account for an additional 9 percent of the national R&D performance effort. R&D performance by this sector is estimated to reach $11.2 billion in 1987, a 5-percent increase from 1986 (2 percent when adjusted for inflation). Between 1975 and 1980, university and college R&D performance increased by 21 percent in constant dollars (3.8 percent annually), but fell off to a 1.6-percent average annual rate between 1980 and 1983. This leveling reflected cutbacks in Federal funding, particularly in the health area, and the slow (0.3 percent) annual growth in State and local real-dollar funding of universities and colleges. Since 1983, real increases from Federal support sources have resulted in an estimated 26-percent rise through 1987 (an average annual increase of 6 percent). Federal Government agencies fund about two-thirds of academic R&D performance.

In 1987, R&D performance by university- and college-administered FFRDCs is estimated at $3.8 billion; this would account for 3 percent of the national R&D effort. Taken together, research and development performed by universities and colleges and by academically administered FFRDCs account for an estimated 12 percent of the Nation's 1987 R&D performance. Between 1974 and 1980, university- and college-associated FFRDCs increased their R&D performance by 60 percent in constant dollars. This increase in FFRDC performance largely mirrored the Federal emphasis on energy programs. Since 1980, the Federal shift from energy to defense has resulted in an estimated constant-dollar increase of 21 percent, one-third the previous 6-year gain.

research and development by national objective

Historically, the Nation's largest R&D spending area has been defense (chart 9). In the early sixties, more



than one-half of total national R&D expenditures was in this area. By the late sixties, however, relative Federal R&D defense spending had declined substantially, while industry funding in civilian areas had begun to increase.[8] Defense research and development consequently fell to less than 30 percent of the national R&D effort by the midseventies; by 1980, defense was as low as 22 percent. Since then the defense share has been increasing and is expected to reach 33 percent of the national total in 1987. Most of the remaining national R&D effort in 1987 is expected to be for health, space, and other civilian and nondefense areas.

the federal r&d funds/ total budget funds ratio

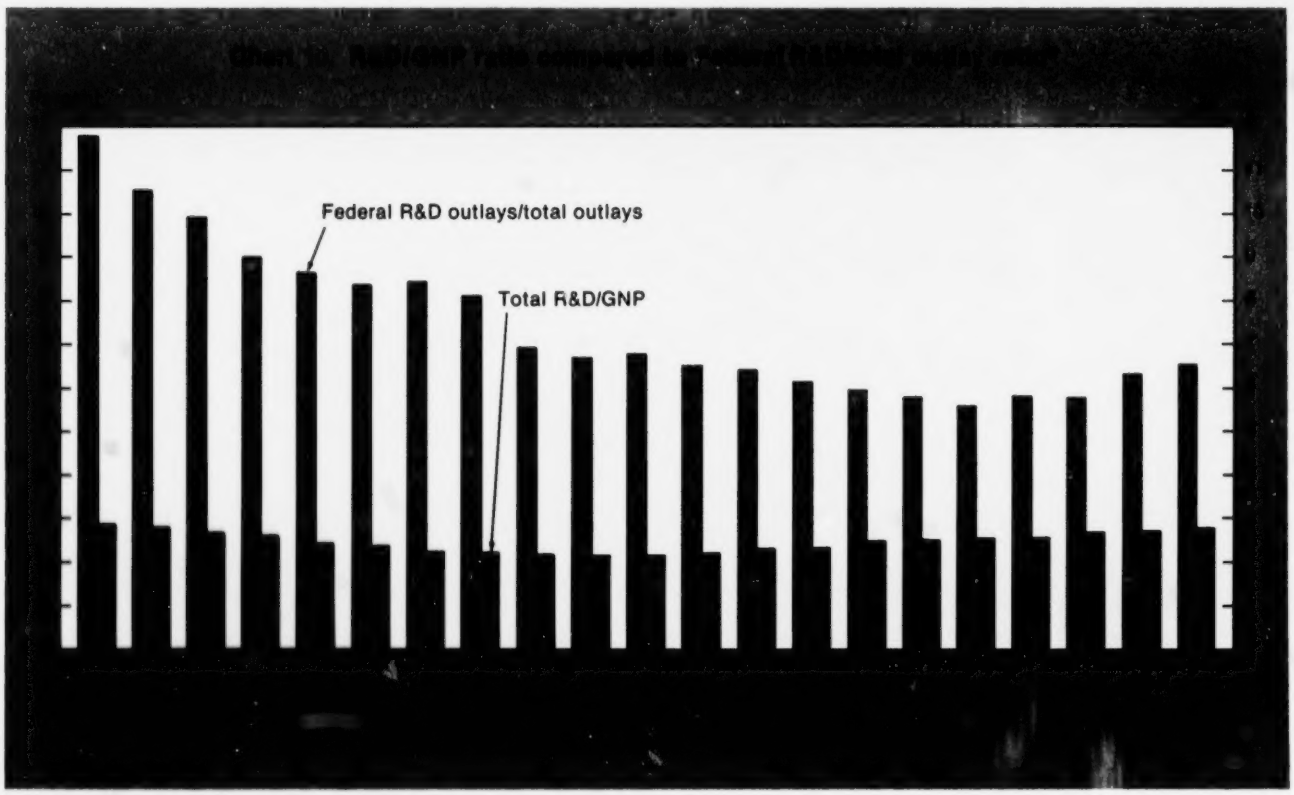
One way to gauge the Government's priority for research and development is to compare Federal outlays for research and development with total Federal outlays for all purposes. In 1987, total Federal outlays (for on-budget programs only) are estimated at $821 billion.[9] Outlays for research and development are estimated at $53 billion, or 6.5 percent of the total; this is up slightly from the 1986 ratio of 6.3 percent (chart 10).

Between 1967 and 1983, R&D outlays as a percentage of total outlays declined steadily, dropping from 11.7 percent to 5.5 percent. The rate of decline, however, was most rapid in the late sixties and early seventies and then slowed considerably from 1975 on. Part of the initial decline (1967–74) in the R&D outlay ratio is explained by the general deemphasis on research and development that prevailed before the first oil embargo; part undoubtedly stemmed from a reduction in defense expenditures with their relatively large R&D component.

By comparison with this earlier period, R&D outlays pretty much held their own during the mid- and late seventies when budget-wide outlay increases were growing rapidly. This in itself is a good indication of the

[8]All industry-funded research and development is classified as civilian research and development, including expenditures by aerospace and electronic industries.

[9]Almost all off-budget receipts and disbursements are for Social Security programs (the Federal Old-Age and Survivors Insurance and the Federal Disability Insurance trust funds) which are excluded from the budget totals by the Balanced Budget and Emergency Deficit Control Act of 1985. Off-budget outlays for fiscal year 1987 are estimated at $194 billion.



higher priority accorded R&D funding after 1974. Between 1984 and 1987, the R&D outlay ratio began to increase to its current 6.5-percent level.

In terms of budget function,[10] research and development in 1987 is estimated to account for 14 percent of Federal defense spending and 3 percent of total Federal nondefense funds (table 2). In nondefense areas, research and development is expected to account for 16 percent of health funds, 34 percent of space funds, and more than 80 percent of funds for both energy and general science. For all other Government functions, research and development represents only about 0.5 percent of the total. The major factor behind the high R&D/total funds ratio for energy is that, since the early eighties, energy funds increasingly have been directed to basic and applied research on energy science activities providing knowledge for future energy technologies.[11]

Table 2. Estimated budget authority for research and development as a percent of total Federal budget authority by function: 1987

[Dollars in millions]

Function	R&D total	Federal total	R&D percent share
Total budget	$58,148	$1,093,933	5.3%
On budget	58,148	879,915	6.6
National defense	40,260	292,927	13.7
Non-defense (on-budget)	17,888	586,988	3.0
Energy	2,155	2,637	81.7
Health	6,608	40,262	16.4
General science	2,041	2,345	87.0
Space research and technology	3,344	9,809	34.1
Natural resources and Environment	1,083	13,241	8.2
All other	2,657	518,694	.5

SOURCES: National Science Foundation, SRS and Office of Management and Budget

the r&d/gnp ratio

The R&D/GNP ratio, which is a measure of the total Nation's commitment to research and development, has been more stable than the Federal research and development/total funds ratio. In 1987, total U.S. R&D expenditures ($123 billion) are expected to equal 2.7 percent of the Nation's GNP ($4.49 trillion), a ratio largely unchanged from 1986 levels (table B-15).

After peaking at 2.9 percent in 1964, the R&D/GNP ratio declined gradually to 2.1 percent in 1978. This drop reflected Federal cutbacks in defense and space R&D programs during a period when the GNP continued to increase. Gains in R&D energy activities between 1975 and 1979 resulted in a relative stabilization of this ratio at around 2.1 percent to 2.2 percent. Since then, the ratio has increased steadily from 2.2 percent in 1979 to 2.7 percent in 1987. A large part of this increase, however, resulted as much from a slowdown in GNP growth as from increased spending on R&D activities. For example, the recessions during 1980 and 1982 resulted in a slight decline in real GNP between these 2 years. Since that time, the Nation's real GNP has increased at an average annual rate of 3.8 percent. Spending for research and development has increased at about 5 percent annually in real terms.

basic research, applied research, and development

Between 1975 and 1980, national spending on basic research, applied research, and development increased at average annual constant-dollar rates of 3.6 percent, 4.2 percent, and 4.2 percent, respectively. These were up substantially from the rates that prevailed between 1967 and 1975: −0.8 percent for basic research, 0.1 percent for applied research, and −1.2 percent for development. Federal support of basic research during the 1975–80 period went up in real terms at a faster rate (3.8 percent annually) than did Federal support for either applied research (2.7 percent) or development (1.5 percent). The annual gains in non-Federal support were greatest in development (6.5 percent) and applied research (5.6 percent). Non-Federal support for basic research increased during this period by 3.3 percent annually.

Data and estimates for the 1980–87 period show the largest Federal constant-dollar growth was for development activities (7.4 percent annually); this reflects increased defense spending. Federal funding of basic and applied research for the period grew at average annual rates of 3.1 percent and 4.1 percent, respectively. Non-Federal support increased in all areas during the 1980–87 period. Real non-Federal growth averaged 6.1 percent annually for basic research, 5.3 percent for applied research, and 4.3 percent for development. In 1987, 12 percent of total national R&D expenditures are for basic research, 21 percent for applied research, and 67 percent for development.

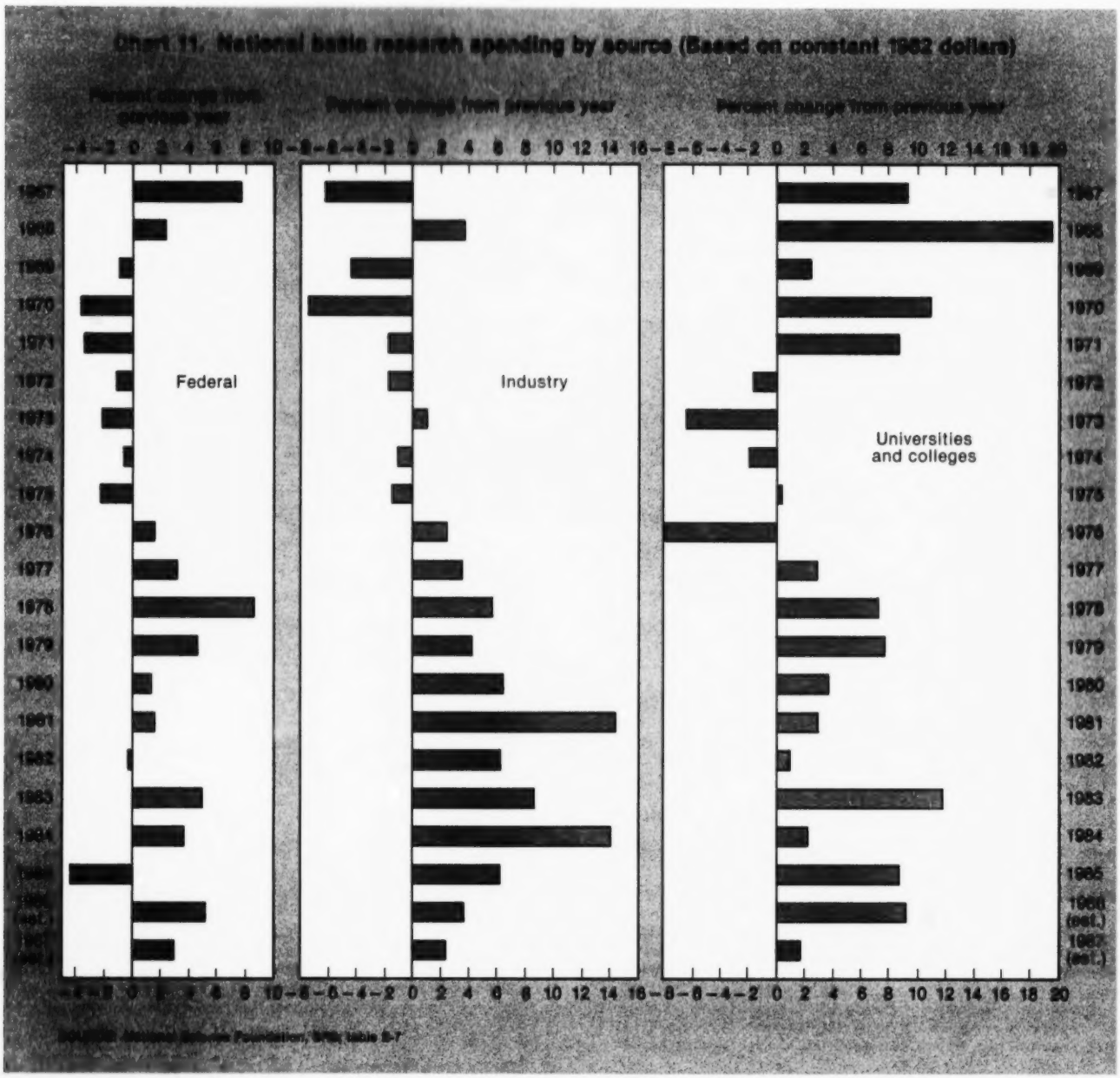
[10]Ratios are for on-budget authorizations.

[11]Office of Management and Budget, *Budget of the United States Government, Fiscal Year 1988, Supplement* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1987).

basic research

In 1986, total spending on basic research amounted to an estimated $14.2 billion, a gain of 8 percent over 1985—5 percent in real terms. This growth continued an upward trend that began in 1976 and resulted in a 55-percent funding increase (constant dollars) during the 10-year period. Federal support increased 44 percent between 1976 and 1986, while the smaller non-Federal support for basic research rose by 79 percent (chart 11).

In 1987, the increase in national basic research spending is expected to slow to 6 percent (to $15 billion), or 2 percent in real terms. Non-Federal basic research support should increase an estimated 2 percent in real terms, while constant-dollar Federal support should be 3 percent more than that provided in 1986. The Federal Government supports approximately 65 percent of the Nation's expenditures on basic research; it performs 15 percent of same.



The second largest supporter of basic research, the industrial sector, accounts for more than one-fifth of the national total. In 1987, industry support of basic research is expected to reach $3 billion, 6 percent more than in 1986 (2 percent after adjustment for inflation). Between 1975 and 1987, industrial support increased at an average annual constant-dollar rate of 6.4 percent. This growth followed a 9-year period during which industrial spending for basic research fell at an average annual rate of 2.3 percent (chart 11). Over this period, 1967–75, R&D managers placed more stringent controls on R&D activities by mandating that such projects have clearly defined objectives. Consequently, many basic research projects were postponed or canceled in favor of more immediate product- and process-oriented activities. In the midseventies, renewed optimism about the long-range potential of basic research—particularly in energy-related areas—was a major factor in reversing this earlier trend.

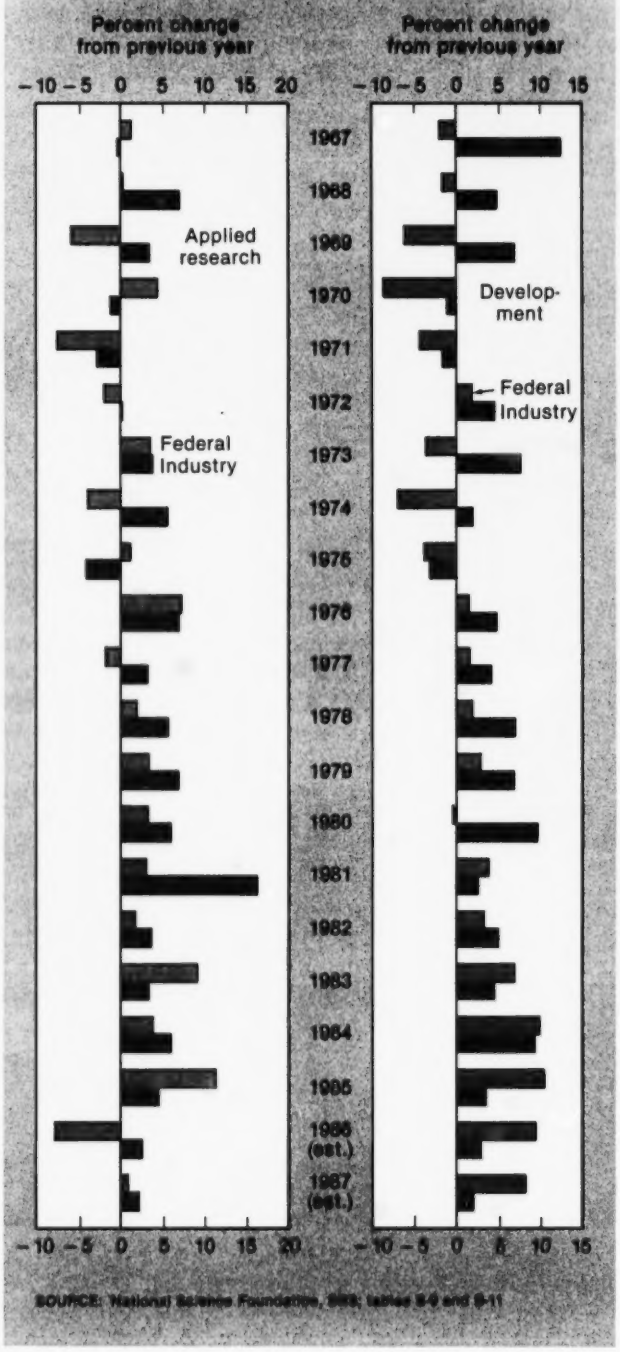
In 1987, universities and colleges are expected to spend $1.6 billion of their own funds on support of basic research. Other nonprofit organizations are expected to contribute an additional $0.7 billion during the year.

Although universities and colleges support only 10 percent of national basic research funding, they perform one-half of such work. Two-thirds of their basic research funding comes from the Federal Government, primarily NIH and the National Science Foundation. In 1987, universities and colleges are expected to perform $7.4 billion of basic research, up 4 percent from 1986 levels (1 percent in real terms). This small increase represents a substantial slowing from the rapid growth in university and college basic research performance of the previous 2 years; during that time, spending rose 19 percent in constant dollars. Industry support of basic research in universities and colleges is expected to amount to $390 million in 1987, a 4-percent increase from 1986 levels. Five years earlier, industry's support of basic research in universities and colleges was only one-half this amount ($198 million).

applied research

National spending on applied research is expected to reach $26 billion in 1987. This figure is 5 percent more than in 1986, or—in real terms—a 2-percent gain. After adjustment for inflation, Federal support is expected to increase by 1 percent, after having fallen by 8 percent in 1986. This was the first such decline in Federal applied research funding since 1977 (chart 12). The decline stems mostly from DOD's reduction in relative support for research in favor of support for development activities. Industrial support for applied research is estimated to increase in 1987 by 6 percent (2 percent in real terms).

Chart 12. Applied research and development spending by source (Based on constant 1982 dollars)



SOURCE: National Science Foundation, [illegible], tables B-9 and B-11

Between 1975 and 1987, national applied research spending grew at an average annual constant-dollar rate of 4.2 percent. Average annual increases in industrial support of 5.5 percent (constant dollars) during this period accounted for most of this growth. Federal support during the same period grew in real terms by 2.9 percent annually; it is estimated to account for 43 percent of the Nation's support for applied research.

Two-thirds of the Nation's applied research is performed within industrial laboratories. Nearly three-fourths of the money spent on industrial applied research is provided out of companies' own funds; the remainder is from Federal sources. In 1987, expenditures for applied research in industry are expected to reach $17.6 billion, 5 percent more than in 1986. After adjusting for inflation, industrial applied research performance is up 2 percent in 1987; it had fallen 4 percent in 1986. These increases compare with 8.8-percent average annual real-term growth registered between 1979 and 1985. Annual growth was never less than 6.8 percent during this period. The 1986 and 1987 figures reflect a recent shift in greater industrial commitment to development, rather than research, efforts.

At an estimated $3.3 billion in 1987, the Federal Government continues to be the second largest performer of applied research in the Nation. This figure is a 6-percent increase from 1986, or 3 percent in real terms. Between 1976 and 1986, Federal applied research performance had diminished by 20 percent in real terms, mainly because of cutbacks at NASA where spending decreased by one-half in constant dollars. NASA performed 30 percent of total Federal intramural applied research in 1976; in 1986, its share was 17 percent of the Federal total. In 1987, NASA's share is estimated to be back up to 19 percent of this intramural total.

development

In 1987, national spending on development amounted to an estimated $82.1 billion, or two-thirds of national expenditures on total R&D activities. These expenditures represent an 8-percent increase in development support over 1986 (5 percent in real terms). Industry provides 52 percent ($42.3 billion) and the Federal Government 48 percent ($39.4 billion) of the development support in the Nation. Both of these sources have been increasing their development spending in real terms since 1975. Industry support increased at four times the rate of Federal through 1980: 6.5 percent annually versus 1.5 percent. Since then, however, Federal support for development has increased faster than has industry's primarily because of Government's increased funding for defense programs. Federal support has increased at an average annual 7.4-percent constant-dollar rate between 1980 and 1987, compared to a 4.3-percent annual rate of growth in industrial development support (chart 12).

Industry is estimated to account for nearly 84 percent ($68.7 billion) of the Nation's total 1987 development performance. Company expenditures for applied research and development activities are concentrated in six major R&D-performing industries—electrical equipment, machinery, chemicals and allied products, motor vehicles and motor vehicles equipment, professional and scientific equipment, and aircraft and missiles.

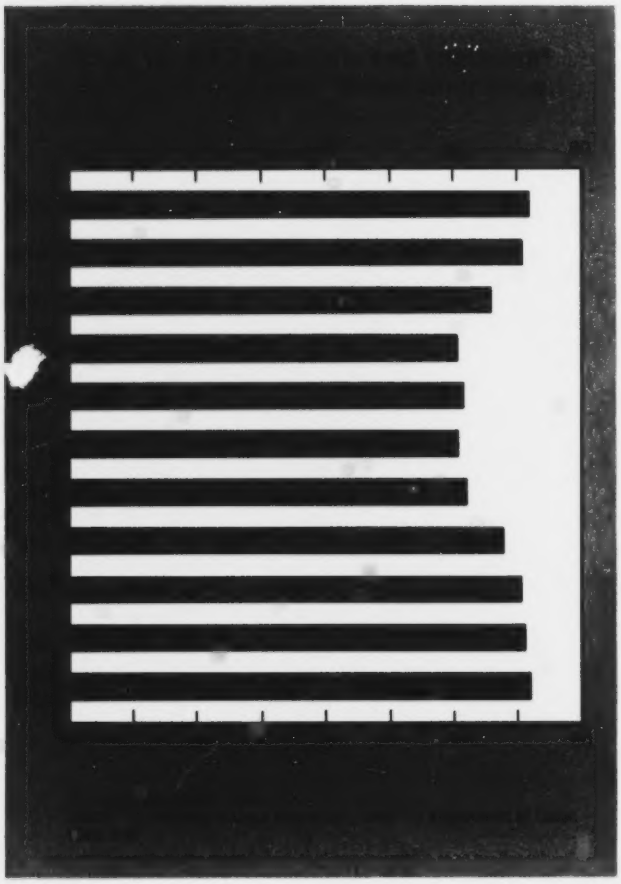
Government is the Nation's second largest performer of development activities, with about 12 percent of the total in 1987. In real terms, Federal development performance has increased at an average annual rate of 8.7 percent since 1980. Industry development performance increased at three-fifths that rate (5.3 percent) during the same period. More than 90 percent of the Federal Government's intramural development performance is estimated for defense in 1987, compared with 75 percent of its total in the midseventies. Similarly, Federal support to industry in 1987 for defense development activities is expected to account for more than 90 percent of total Federal industrial development funding, compared to two-thirds this total a decade earlier.

full-time-equivalent (fte) r&d scientists and engineers

In 1986, the full-time equivalent of 802,300 scientists and engineers were estimated to be employed on R&D activities in the United States. This was an increase of about 4 percent from the 1985 level of 772,500, and about 50 percent more than the 1976 figure (chart 13). Three-fourths were employed by industry in 1986; universities and colleges (14 percent) and the Federal Government (8 percent) employed most of the rest. Throughout the midseventies, for every 10,000 persons employed in the civilian labor force, approximately 61 were FTE R&D scientists or engineers. Continued increases in national R&D funding have caused this ratio to increase since 1979 to its 1986 level of 73 per 10,000.

Between 1975 and 1981, real R&D expenditures for industrial research and development correlated closely with annual changes in the number of FTE R&D scientists and engineers employed by industry. Beginning in 1982, however, such R&D spending has tended to increase at a somewhat faster pace than has this measure of industrial R&D employment. Primary reasons cited for this change in industry's R&D spending/employment relationship are (1) the increasing use of R&D budgets

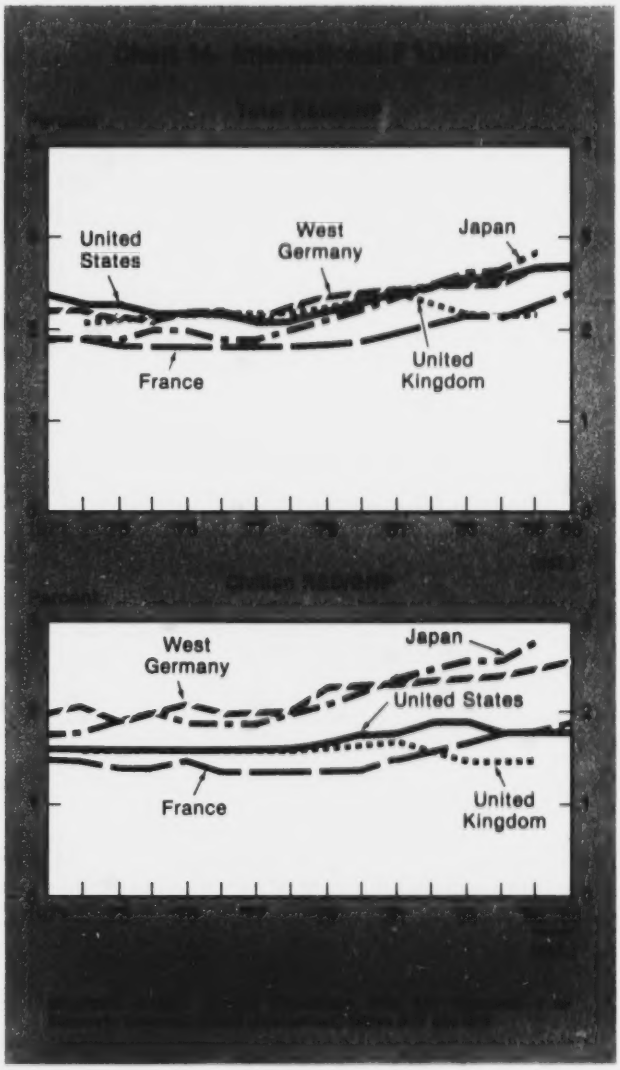
to purchase advanced technological equipment and instrumentation systems; and (2) higher company salaries for R&D scientists and engineers.



international comparisons

The relative emphasis countries place on R&D activities can be determined by several methods. The two most commonly used are (1) comparison of R&D expenditures with GNP and (2) comparison of R&D scientists and engineers with the labor force. These ratios overcome much of the difficulty of interpretation produced by inflation, exchange rate fluctuations, different unit costs, and differences in the volume of research efforts. Nonetheless, because of variances in the manner in which countries compile R&D data, caution still must be exercised in making international comparisons.

The United States spends more money on R&D activities than any other country; it spends more than France, West Germany, the United Kingdom, and Japan combined. During the early and midsixties, the United States also had the highest R&D/GNP ratio: almost 3 percent. After 1964, however, the U.S. ratio began to decline—largely because of cutbacks in Federal R&D spending for defense and space—while the GNP continued to increase. At the same time, the ratios in other countries—notably West Germany and Japan—increased, primarily as a result of large gains in government R&D funding. These divergent trends continued until the midseventies, at which point the U.S. ratio had dropped to 2.1 percent and was about equal to those in West Germany, the United Kingdom, and Japan (chart 14).

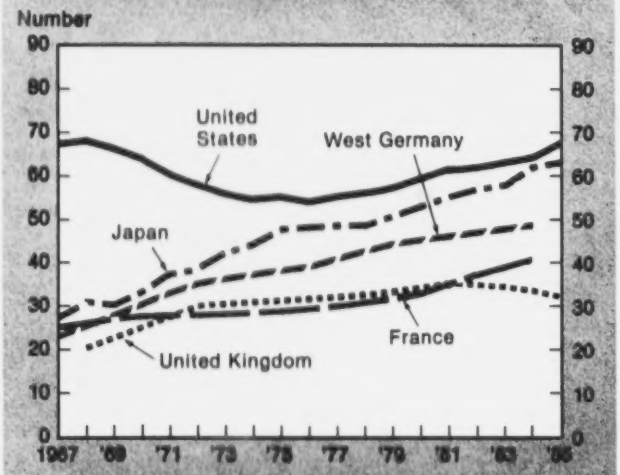


By the late seventies and early eighties, the ratios in all countries were again increasing. In 1985, for example, the U.S. ratio had risen to 2.7 percent, about equal to the ratios in West Germany and Japan.

Excluding defense activities from the R&D data presents a somewhat different picture. For example, the resulting nondefense R&D/GNP ratio for the United States in 1985 (1.8 percent) was considerably lower than those for West Germany (2.5 percent) and Japan (2.8 percent). Seventy percent of the U.S. R&D effort was spent on nondefense activities as compared with more than 90 percent in these two countries. Thus, when only the civilian R&D/GNP ratio is considered, West Germany and Japan have been ahead of the United States for 15 years, and their rate of civilian R&D investment as a percentage of GNP has been rising faster than the United States' for the past 5 years. In terms of the nondefense R&D/GNP ratio, France has been catching up to U.S. levels, especially in the eighties; the United Kingdom apparently has been falling behind (chart 14).

Comparing the number of FTE R&D scientists and engineers with the labor force results in a ratio higher in the United States than in the other industrialized market economies. According to 1985 data, there were about 67 R&D professionals per 10,000 in the U.S. labor force (chart 15).[12] The ratio in the United States has been increasing each year since 1976. The ratios in most other countries also have been increasing annually since the sixties, especially in Japan. Currently there are about 63

Chart 15. International R&D scientists and engineers/10,000 labor force



SOURCES: National Science Foundation, BMBF, and Organisation for Economic Cooperation and Development; table 6-19

R&D professionals per 10,000 workers in Japan's labor force; this is close to the U.S. ratio. In the late sixties, the Japanese ratio was only one-half the R&D/labor force ratio for the United States. The other countries' ratios are substantially lower (30 to 50 FTE R&D professionals per 10,000) than the U.S. ratio.

[12]This compares with 71 R&D professionals per 10,000 in the employed civilian labor force in 1985.

s/e personnel

employment trends

Rapid growth in science and engineering employment during the past decade is an indicator of the increasingly important role played by science and technology in the U.S. economy. Despite the two economic recessions in the early eighties, the number of employed scientists and engineers increased at an average annual rate of 7.1 percent between 1976 and 1986, reaching 4.6 million—or nearly 4.2 percent—of the employed civilian workforce. In 1976, employed scientists and engineers represented 2.6 percent of the workforce.[13] Employment of scientists and engineers increased more than three times as fast as annual growth in the total U.S. workforce, and about twice the yearly rate of increase in total professional employment. Of the 4.6 million scientists and engineers, 15 percent (700,000) reported that they held jobs outside of science and engineering in 1986. Scientists were more likely than engineers to be employed in non-S/E activities.

All major sectors of the economy—industry, academia, and government—reported increases in S/E employment during the past decade.[14] Industry was the primary source of the growth in demand for scientists and engineers: this sector provided 1.7 million new jobs between 1976 and 1986, for an average annual 8.0-percent rate of increase. Two factors underlie industry's importance in contributing to S/E employment. First, scientists and engineers are concentrated in those industries, generally high-technology ones, which have exhibited relatively strong performance; and second, changes in occupational staffing have led to greater concentrations of S/E personnel within industrial workforces.[15] Such changes resulted from several interrelated factors, including: (1) efforts to enhance competitive positions through improvements in productivity, quality control, and cost containment; (2) increases in R&D activities; and (3) technological change, especially with respect to the diffusion of computer technology.

Academic S/E employment growth kept pace with that of industry, averaging 8.1 percent annually between 1976 and 1986, and adding about 340,000 jobs. This employment growth mirrored increases in academic R&D expenditures.

S/E employment in all levels of government has lagged behind that in other sectors, increasing at a 10-year average annual rate of 5.2 percent. S/E employment in the Federal Government alone grew at an annual rate of 4.9 percent between 1976 and 1986.

Of the 4.6 million scientists and engineers employed in 1986, nearly 2.2 million were scientists and 2.4 million were engineers. Growth in S/E employment varied considerably between these aggregate fields: during the 1976–86 period, reported employment of scientists grew significantly faster than that of engineers (8.6 percent versus 5.9 percent annually). Over the same period, however, the difference between rates of growth for scientists and engineers employed only in S/E jobs was somewhat narrower; 7.1 percent for employed scientists and 5.8 percent for employed engineers.

In 1986, women accounted for 15 percent of all employed scientists and engineers—27 percent of all scientists and 4 percent of all engineers. By comparison, women represented about 44 percent of the overall U.S. workforce and 43 percent of all professional employment.[16] Between 1976 and 1986, the employment of women scientists and engineers grew at more than twice the annual rate of men, 13.3 percent versus 6.3 percent. There is some evidence, however, that the rate of female S/E employment growth has been slowing in recent years.

Racial and ethnic minority groups vary with respect to their representation within the S/E workforce. Blacks and Hispanics[17] are underrepresented in S/E fields, accounting for about 2 percent each of S/E employment in 1986. These compare with professional employment shares of 6 percent for blacks and 5 percent for Hispanics. On the other hand, Asians' 5 percent S/E employment share is more than twice their 2 percent share of the professional workforce.[18]

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[13]For detailed 1986 data on scientists and engineers, see National Science Foundation, *U.S. Scientists and Engineers: 1986* (Detailed Statistical Tables)(NSF 87-322)(Washington, D.C., 1988).

[14]Unless otherwise indicated, S/E employment refers to all employed scientists and engineers regardless of whether they are working in S/E jobs. Of the reported 4.6 million employed scientists and engineers in 1986, 3.9 million were engaged in S/E activities.

[15]National Science Foundation, *Changing Employment Patterns of Scientists, Engineers, and Technicians in Manufacturing Industries: 1977–80* (NSF 82-331)(Washington, D.C., 1983).

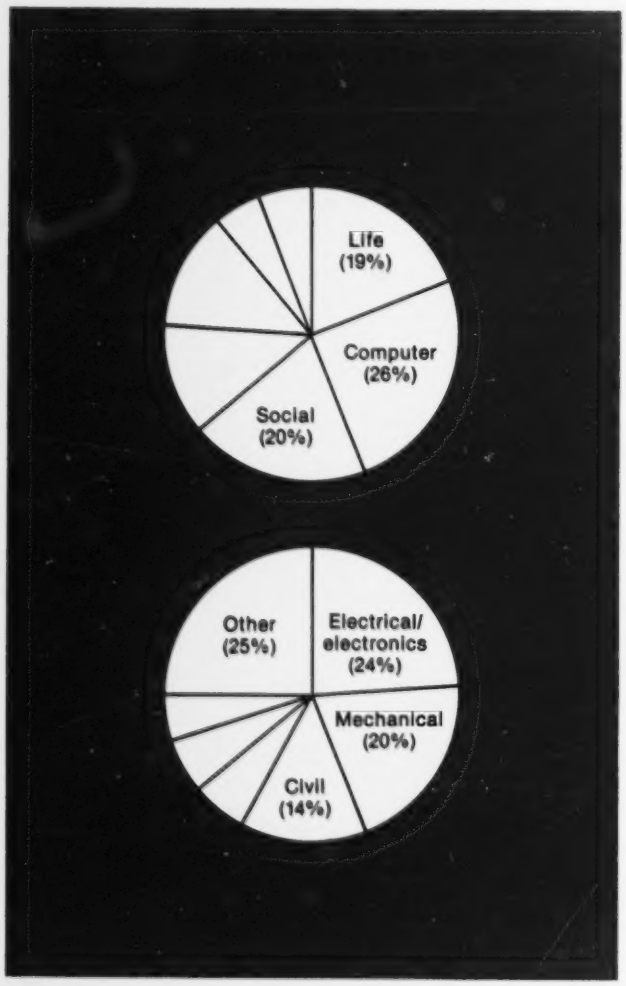
[16]*Economic Report of the President* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, January 1987).

[17]Hispanics include Mexican-Americans, Puerto Ricans, Central Americans, etc.

[18]For a full discussion of the role of women and minorities in the S/E workforce, including recent trends, see National Science Foundation, *Women and Minorities in Science and Engineering* (NSF 88-301)(Washington, D.C., 1988).

Variations in employment growth rates among S/E fields have changed the distribution of the S/E workforce.[19] Computer specialties (including computer science, programming, systems analysis, and other specialties) remains the fastest growing S/E field as computer-related technology continues to be rapidly integrated throughout the U.S. economy. Such employment increased at an annual rate of 16.8 percent between 1976 and 1986 and has surpassed the life sciences—which grew at a 6.8-percent rate of increase—as the largest scientific field. In 1986, computer specialists represented one-quarter of science employment (chart 16). Employment growth during the past decade was far more uniform across engineering fields, varying between 6 percent and 7 percent for each of the major fields (chart 4). In 1986, electrical/electronics and mechanical engineering dominated other fields, representing one-quarter and one-fifth of the engineering workforce, respectively.

[19]These data again refer to changes in the field distribution of total scientists and engineers, regardless of whether they were employed in S/E jobs.



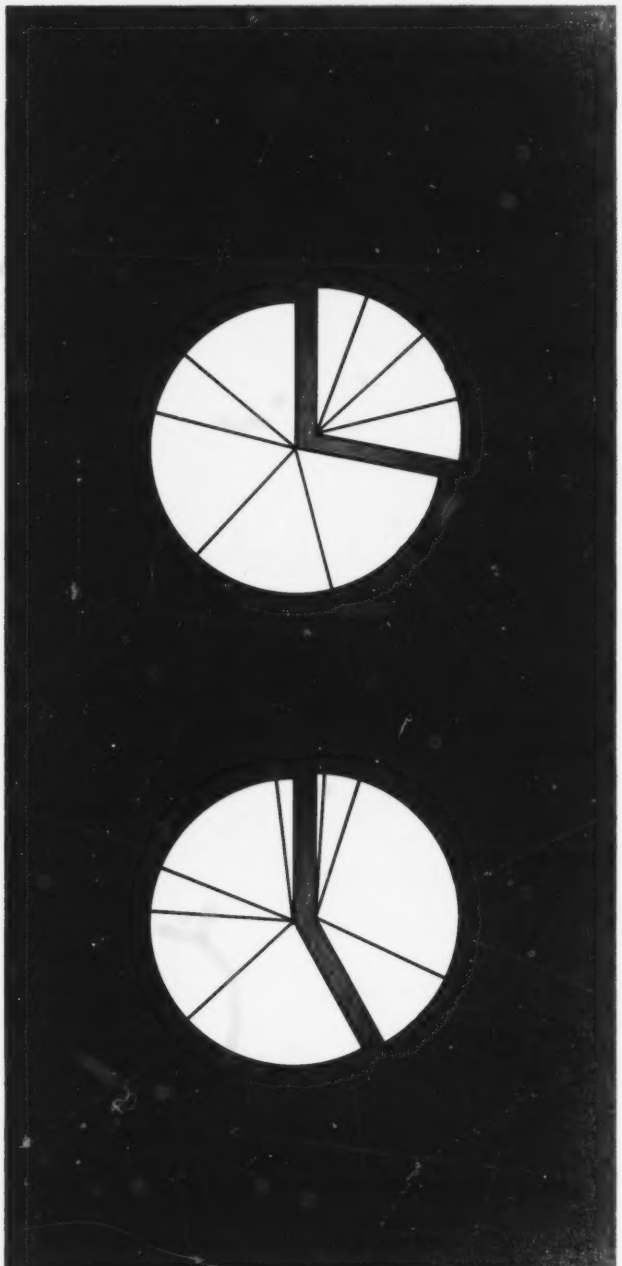
Work activities of scientists and engineers—measured by the level and distribution of those engaged in research and development, teaching, production, and other activities—describe the functions of U.S. scientists and engineers, as well as the skill requirements across employment sectors. Research and development continues to be the principal activity of U.S. scientists and engineers, primarily involving 36 percent of all scientists and engineers employed in 1986. However, growth in the number of S/E personnel reporting research and development as their primary work activity somewhat lagged growth of total S/E personnel between 1976 and 1986 (6.7-percent versus 7.1-percent annual growth).

Disaggregation by character of R&D activity shows increasing involvement of S/E personnel in development (7.2-percent annual growth), offset somewhat by slower rates of increase in the number of people engaged in R&D management and in research (6.1 percent each). In contrast, the proportion of the S/E workforce primarily engaged in production was among the fastest growing activities during the past 10 years. The relatively rapid 8.7-percent annual increase in S/E personnel reporting production as their primary work activity stemmed directly from industry's growing significance in the provision of S/E opportunities.

Differences in primary work activities by S/E field closely parallel concentration within various employment sectors. For example, as a percentage of their respective totals, engineers are more likely than scientists to be engaged in some aspect of development activities (28 percent versus 8 percent). Conversely, scientists tend to be more involved in basic and applied research functions than are engineers (13 percent versus 4 percent). Among remaining work activities, engineers are—because of their ties to industry—most closely linked to production (17 percent) and management (30 percent) activities. Scientists, on the other hand, reported spending more time teaching and preparing reports or data analyses (chart 17).

s/e labor market balance

The S/E population historically has maintained a high rate of labor force participation; this indicates high levels of utilization and a small reserve that can be tapped during times of shortage. In 1986, the labor force participation rate of scientists and engineers was 95 percent. There was virtually no difference in the individual participation rates of scientists and engineers. While strong labor force attachment is characteristic of highly trained individuals, this rate was significantly above the 82 per-



cent reported for all persons with 4 or more years of college.

The unemployment rate measures the proportion of the labor force that is not employed but is seeking work. Trends and patterns in these rates for scientists and engineers suggest an increasing need for individuals with S/E training and shifts in the composition of the S/E workforce toward those fields of greatest demand. Overall, between 1976 and 1986, the unemployment rate for scientists and engineers decreased from 3.4 percent to 1.5 percent. A decline in the unemployment rate was noted for all reported individual S/E fields, with the exception of environmental scientists and chemical engineers. By comparison, the unemployment rate for the total professional labor force in 1986 was 2.4 percent.

Labor market conditions differ significantly among S/E fields, indicating varying potential for personnel shortages. In 1986, computer specialists reported an unemployment rate of 0.8 percent; physical scientists reported 1.4 percent; and all engineers, 1.2 percent. In particular, aeronautical/astronautical and nuclear engineers reported unemployment rates of 1 percent or less; electrical/electronics engineers reported a 1.1-percent rate. By contrast, among science fields, environmental scientists reported a relatively high unemployment rate of 3.5 percent. Within engineering fields, relatively high unemployment rates were reported for chemical (2.6 percent), petroleum (3.4 percent), and mining (2.2 percent) engineers.

The S/E employment rate measures the extent to which employed scientists and engineers have a job in science or engineering. A low rate suggests skill underutilization and a potential S/E labor reserve, while a high rate could signal a potential for shortages. Of the estimated 4.6 million scientists and engineers employed in 1986, 3.9 million (85 percent) were engaged in S/E activities. Between 1976 and 1986, the S/E employment rate dropped from 91 percent to 85 percent. Rates for engineers were well above those for scientists—92 percent and 77 percent, respectively—in 1986.

Within science fields, S/E employment rates ranged from 61 percent in the social sciences to 92 percent in the physical sciences. Among engineering fields, nuclear engineers had the highest S/E employment rate (98 percent); industrial engineers had the lowest (82 percent).

In general, the employment indicators discussed above suggest that the labor market for scientists and engineers has been in rough equilibrium. It can be inferred, for example, from the relatively high S/E participation rates and low S/E unemployment rates that in 1986 there was generally sufficient demand to accommodate the S/E labor force. Correspondingly, relatively few industrial employers reported shortages of S/E personnel in 1986. According to survey respondents, the only fields with as many as 15 percent of their employers reporting shortages were computer and biochemical engineering; the only other fields with shortages reported by more than 5 percent of their employers were electronic, electrical, industrial, and aeronautical/astronautical engineering and computer systems analysis.[20]

This relative balance in the industrial S/E employment situation contrasts with reports of persistent shortages of engineering school faculty. In 1986, for example, almost 9 percent of authorized full-time engineering faculty positions were unfilled; further, many institutions

[20]National Science Foundation/SRS unpublished data.

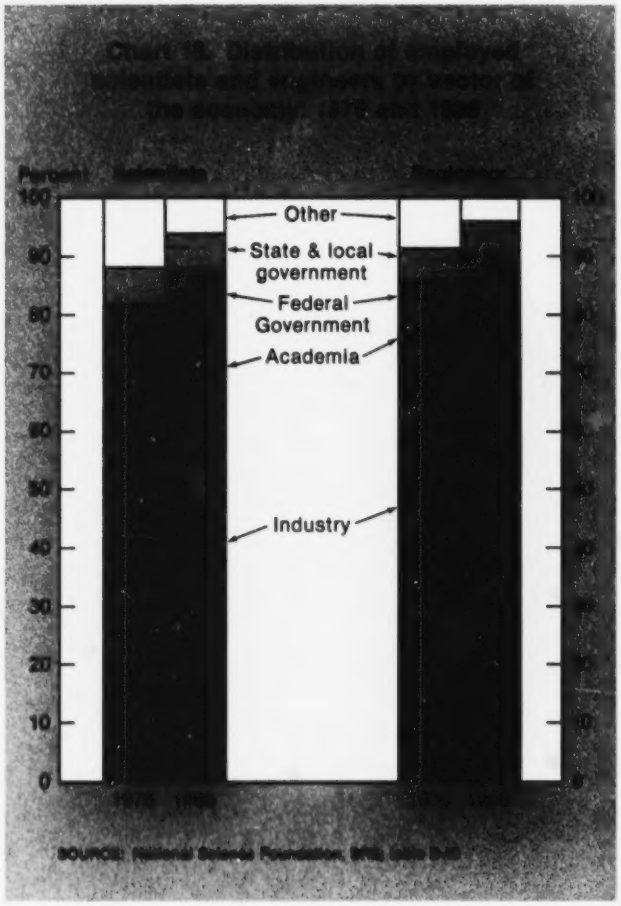
reported that the authorized levels would be higher if it were possible to fill such positions.[21] Probable causes of engineering faculty shortages are (1) the long-term decline in engineering doctorates awarded to U.S. citizens, and (2) the sector's problems in competing with industry in providing higher salaries and opportunities to work with state-of-the-art technology.

Projecting forward, high-technology industrial growth and the increasing use of high-technology goods and services in the economy as a whole should lead to greater demand for scientists and engineers in industry. The Bureau of Labor Statistics estimates that demand for S/E personnel—including technicians—will increase by 36 percent between 1986 and 2000, compared with a 20-percent increase for all occupations.[22] Among science occupations, the highest anticipated growth is expected for computer specialists (77 percent), and the lowest for physical scientists (13 percent). In engineering, the highest job growth is expected in electrical and electronics occupations (48 percent); the lowest anticipated growth is for nuclear engineers (less than 1 percent).

sectoral patterns and trends

Since the midseventies, the sectoral distribution of scientists and engineers (including both those employed in S/E and non-S/E jobs) has changed slightly. Between 1976 and 1986, there was a 5-percentage point increase in the proportion employed by industry and a 1-point increase in State and local governments' share. There were corresponding 1- to 2-percentage-point reductions in the shares employed by educational institutions and the Federal Government. While sectoral changes are apparent at all S/E-degree levels, they have been most pronounced at the doctoral level. Here, employment opportunities have shifted significantly from academia to industry since the early seventies.

Industry is the largest employer of both scientists and engineers (chart 18). In 1986, 56 percent of all scientists (1.2 million) and 80 percent of all engineers (1.9 million) worked in this sector. The importance of industry in providing S/E job opportunities varies considerably by field. For example, industry employed 78 percent of computer specialists, roughly 60 percent of both physical and environmental scientists, one-half of social scientists, and about 40 percent of both mathematical and life



scientists. Among engineering fields, the proportion employed in industry ranged from 91 percent of petroleum engineers to 62 percent each of civil and nuclear engineers.

Between 1976 and 1986, annual growth in the employment of scientists in industry outpaced that of engineers, 10.0 percent versus 6.6 percent. Scientific employment growth was driven almost entirely by the rapid application of computer technology throughout industry which has generated a strong demand for personnel with computer-based skills. For engineers, employment growth was driven by the relatively strong demand for civil, electrical/electronics, and aeronautical/astronautical engineers.

Although the United States is moving from a production- to a service-oriented economy, a large fraction of industry's demand for S/E personnel remains concentrated in the manufacturing sector. For example, although manufacturing industries employed less than one-quarter of the total industrial workforce in 1986, they provided jobs for 60 percent of engineers and 30 percent of scientists employed by all industry. The importance

[21]National Science Foundation, *Young and Senior Science and Engineering Faculty and Nonfaculty Research Doctorates: 1986* (forthcoming).

[22]Bureau of Labor Statistics, Department of Labor, unpublished data. Growth projections are based on their "moderate trend" scenario.

of the manufacturing sector in determining S/E employment rests on the fact that the majority of technology-intensive industries (as measured by the concentration of S/E personnel within their workforces) are found in this sector. These industries include chemicals and other allied products, electrical machinery, computers, transportation equipment, professional instruments, refined petroleum products, and nonelectrical machinery.

The Bureau of Labor Statistics reports that—in addition to scientists and engineers—industry employed almost 1.8 million S/E support technicians (including computer programmers and drafters) in 1986. This is up considerably from the 0.9 million technicians employed by industry in 1977. Mostly because of the relative importance of computer programmers and electrical/electronics engineering technicians to service-oriented activities, nonmanufacturing industries employed about three-fifths of all technicians in 1986; manufacturing industries employed about two-fifths.

Academia is the second largest employer of S/E personnel, employing about 24 percent of all scientists in the United States and 4 percent of all engineers in 1980. Academia employed 14 percent of the combined S/E total. The importance of educational institutions in providing S/E employment opportunities varies significantly by field. For example, in 1986, academia provided jobs to 45 percent of mathematical scientists, 36 percent of life scientists, 31 percent of psychologists, and 26 percent of social scientists. At the other extreme, these institutions employed only 7 percent of computer specialists.

In 1986, the Federal Government employed nearly 8 percent of all scientists and engineers, making it the third-largest S/E employer. State and local government employed another 5 percent of these personnel. Employment of engineers and scientists in all levels of government grew at annual rates of 5.1 percent and 5.4 percent, respectively, between 1976 and 1986. Personnel specialists have been concerned about government's ability to compete with other employment sectors in recruiting and retaining engineers, primarily because of noncompetitive salaries. In 1980, for example, there was no difference between the Federal Government and industry in starting salaries for baccalaureate engineers; by 1982, however, starting salaries for those in the Government had fallen to roughly 80 percent of those in industry.[23]

Federal employment is more technologically intensive than is employment of the overall workforce. In 1985, nearly 15 percent of Federal civilian white-collar workers were scientists or engineers, compared to only 6 percent of total white-collar employment in the United States. Computer specialists accounted for 17 percent of Federal Government S/E personnel. Fully 55 percent of the civilian white-collar workforce at NASA; 42 percent at the Environmental Protection Agency; and about 30 percent each at the Departments of Agriculture, Commerce, Energy, and the Interior were employed in S/E occupations. DOD was the largest Federal employer of S/E personnel in 1985 providing jobs to one-half of all S/E personnel employed by the Government.[24]

doctoral scientists and engineers

Between 1975 and 1985, the employment of S/E doctorate-holders increased by 4.6 percent annually, reaching a level of 400,000.[25] While their unemployment rates have remained uniformly low across all fields, the proportion of S/E doctorate-holders employed in non-S/E jobs has been increasing, rising from 6 percent in 1975 to 9 percent in 1985.

In 1985, doctoral scientists continued to outnumber doctoral engineers by about five to one, although—during the 1975–85 decade—employment growth of S/E doctorate-holders varied considerably by field. The lowest annual rates were recorded for physical and mathematical sciences, with 2.1-percent growth each per year. Computer specialties was the fastest growing science field, increasing by 15.6 percent annually (chart 19). Differential growth rates altered the field distributions of doctoral scientists and engineers during this period. Most notably, the proportions in the social sciences, psychology, and computer science increased; while the proportion in the physical sciences declined. Life sciences continue to account for the largest employment share (25 percent) of S/E doctorate-holders.

Between 1975 and 1985, there were also notable changes in the distribution of doctoral S/E employment by sector. For example, the employment of Ph.D. scientists and engineers in industry nearly doubled, increasing (on average) by 6.9 percent annually. As a result, the industrial share of total doctoral S/E employment increased from 25 percent in 1975 to 31 percent in 1985. This sectoral redistribution of the doctoral S/E workforce also was caused by a slow 3.6-percent academic employment growth rate. Academia accounted for 53 percent of the doctoral S/E workforce in 1985; this was down from its 1975 58-percent share.

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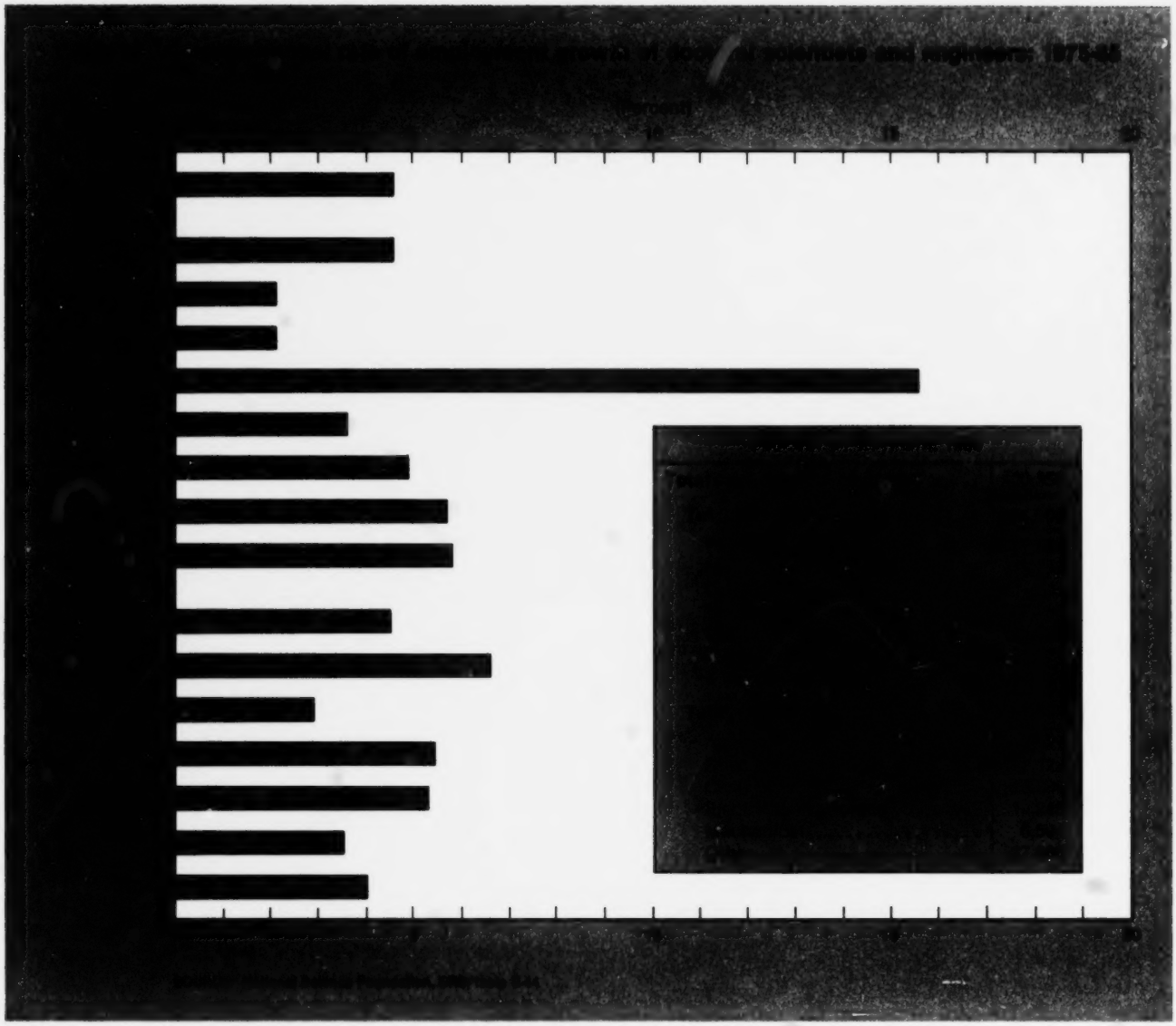
[23]National Science Foundation, *Federal Scientific and Technical Workers: Numbers and Characteristics, 1973 and 1983* (NSF 85-312)(Washington, D.C., 1985).

[24]National Science Foundation, *Federal Scientists and Engineers: 1985* (Detailed Statistical Tables)(Washington, D.C., 1986); and Office of Personnel Management, *Federal Civilian Workforce Statistics: Occupations of Federal White-Collar and Blue-Collar Workers* (Washington, D.C., October 31, 1985).

[25]National Science Foundation, *Characteristics of Doctoral Scientists and Engineers in the United States: 1985* (Detailed Statistical Tables)(Washington, D.C., 1986).



The sectoral employment shifts of doctoral scientists and engineers have significantly affected their work activity patterns. There was sluggish growth in the number of doctorate-holders reporting teaching or management as their primary activity during the 1975–85 period. As a share of all work activities, teaching fell from 36 percent in 1975 to 28 percent in 1985. This decline was directly related to both the shift to nonacademic employment and the growing relative importance of basic and applied research in universities. Management activities as a share of the total declined from 20 percent to 17 percent over the same period.

The declining proportion of S/E doctorate-holders engaged in teaching and management was offset by gains in sales, production, and other related activities. Between 1975 and 1985, these latter activities increased sharply, accounting for 18 percent of all 1985 activities (up from 10 percent in 1975).

Throughout this 10-year period, approximately one-third of those holding S/E doctorates were employed in research and development. Over the last couple of years, however, the rate of increase in the number of S/E doctorate-holders engaged in research and development has slowed somewhat in industry, but has accelerated for doctorate-holders employed in educational institutions. For industry, the slowing largely reflects shifts in employment away from R&D-intensive fields. The more rapid increases in academic R&D employment mirror the

growth in academic R&D expenditures; these increased (in constant dollars) by 6.6 percent annually between 1983 and 1985, compared to 3-percent real academic R&D expenditure growth during the 1975–83 period.

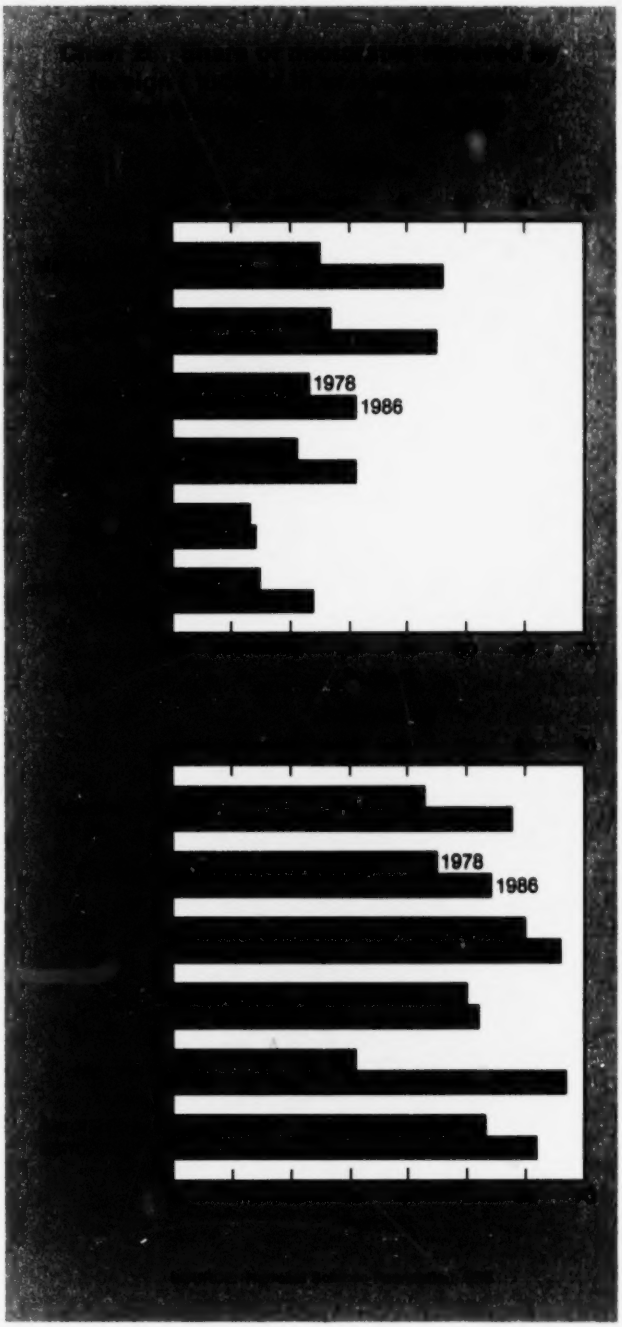
foreign citizen participation

Attention recently has been focused on the ratio of foreign to U.S. citizen involvement in S/E activities in the United States. The broad issues are (1) the effect of increased foreign participation on the health of U.S. institutions of higher education, and (2) the potential impact of foreign S/E personnel on the domestic labor market.

Over the past 30 years, the number of foreign enrollments in U.S. universities and colleges has increased tenfold. In the 1985/86 academic year, approximately 344,000 students—slightly less than 3 percent of the total U.S. enrollment—were foreign. The majority of these students were from developing countries in South and East Asia, led by Taiwan, Malaysia, Korea, India, Iran, and China. Nearly one-half of all foreigners were enrolled in S/E fields; this share has remained relatively constant for 20 years. Of the foreign S/E students, the majority studying engineering were enrolled at the undergraduate level, while the majority in most science fields were at the graduate level.[26]

Despite their rapid enrollment growth during the past three decades, foreign undergraduate students nonetheless receive less than 5 percent of science and 8 percent of engineering baccalaureates annually awarded in the United States. However, as a percent of graduate program enrollment and of advanced S/E degrees awarded, foreign students account for much higher shares than in the past. In 1986, foreign full-time graduate enrollment in S/E doctorate-granting institutions accounted for more than 28 percent of total full-time S/E student enrollment. This was up considerably from the 16-percent share reported in 1976. It also represented a 10-percent increase in foreign S/E graduate students over fall 1985. By contrast, the number of U.S. citizens enrolled rose by 2 percent from the previous year. Foreign graduate students comprised 40 percent or more of the student body in computer and mathematical sciences and most fields of engineering.

Foreign students also have been receiving an increasing share of S/E doctorate degrees awarded from U.S. universities. Between 1960 and 1980, foreign students consistently accounted for 14 percent to 19 percent of all doctorates awarded in the sciences. Since then, their percentage share has been increasing. Foreign students accounted for about one-fourth of Ph.D.'s in engineering throughout the sixties; this proportion has been rising steadily for the past 15 years. In 1986, foreign students received 55 percent of all doctorate degrees in engineering and 23 percent in the sciences (chart 20). Foreign doctorate-degree recipients were fairly evenly represented across all major engineering fields of study.



[26]National Science Foundation, *Foreign Citizens in U.S. Science and Engineering: History, Status, and Outlook* (NSF 86–305 revised)(Washington, D.C., 1987).

Doctorate production is the major source of faculty supply. The high proportion of new engineering doctorates received by foreigners on temporary visas—coupled with the slow overall growth in U.S. citizens receiving such doctorates—has caused concern regarding the adequacy of future supply of engineering faculty. In 1986, about one-fifth (955) of total foreign recipients of S/E doctorates were studying on permanent visas; the remaining four-fifths (4,043) were on temporary visas. About one-half of those foreign students on temporary visas who had firm postgraduate plans at the time of graduation intended to remain in the United States. Of this group (1,370 responses), 54 percent planned to pursue postdoctoral study; a significant number planned to accept employment in academia (27 percent) and industry (17 percent). Of foreign students on permanent visas, about 78 percent who had firm postgraduation plans intended to locate in the United States (442 out of 562 respondents with firm plans).

In 1982—the latest year of available data—foreign-born, naturalized U.S. scientists and engineers made up 13 percent of the S/E workforce. Their concentration within occupations varied, ranging from 18 percent in civil engineering to 11 percent in the social and life sciences. Foreign nationals accounted for 4 percent of the total S/E workforce. Their concentration by field also varied, ranging from 5 percent in mathematical science to 1 percent in psychology. Many of these individuals eventually obtain U.S. citizenship.[27]

s/e pipeline

The S/E pipeline provides important information on the quality and quantity of the future supply of new scientists and engineers. The process begins with the precollege experience of S/E students. High school mathematics and science courses and performance on standardized tests measuring quantitative ability become important determinants for entering S/E degree programs. Thereafter, future supply depends on degree production in S/E fields and on decisions to pursue S/E occupations.

precollege science and mathematics

The decision to pursue an undergraduate S/E program and, subsequently, an S/E career is influenced significantly by exposure to precollege science and mathematics courses providing the basic principles needed to complete S/E undergraduate programs. For example, of high school sophomores in 1980 who graduated in 1982, more than two-thirds had taken three or more mathematics courses; fewer than one-half had taken more than two science courses.[28]

Curriculum placement is a significant factor in determining the extent and type of science and mathematics courses taken. Students following an academic track (versus general or career) tend to elect more advanced mathematics courses in geometry and calculus; they also are more likely than other students to take biology, chemistry, and physics. Between 1981 and 1985, the share of college-bound seniors choosing academic track programs increased 2 percentage points to 78.5 percent.[29]

The Scholastic Aptitude Test (SAT) attempts to measure precollege skill attainment and is widely used by colleges in admissions decisions. The SAT contains verbal and mathematics aptitude tests and offers achievement tests in a variety of subjects. Students who intend to major in science or engineering generally score much higher on both SAT math and verbal tests than do all students taking these tests. Between 1977 and 1986, mean SAT scores for students intending S/E majors remained relatively level: quantitative scores varied between 507 and 517, and verbal scores varied between 444 and 454. However, both verbal and math SAT scores for college-bound seniors intending to major in computer science fell considerably during the 1977–86 period; these scores were down 26 and 40 points, respectively.

s/e degree production

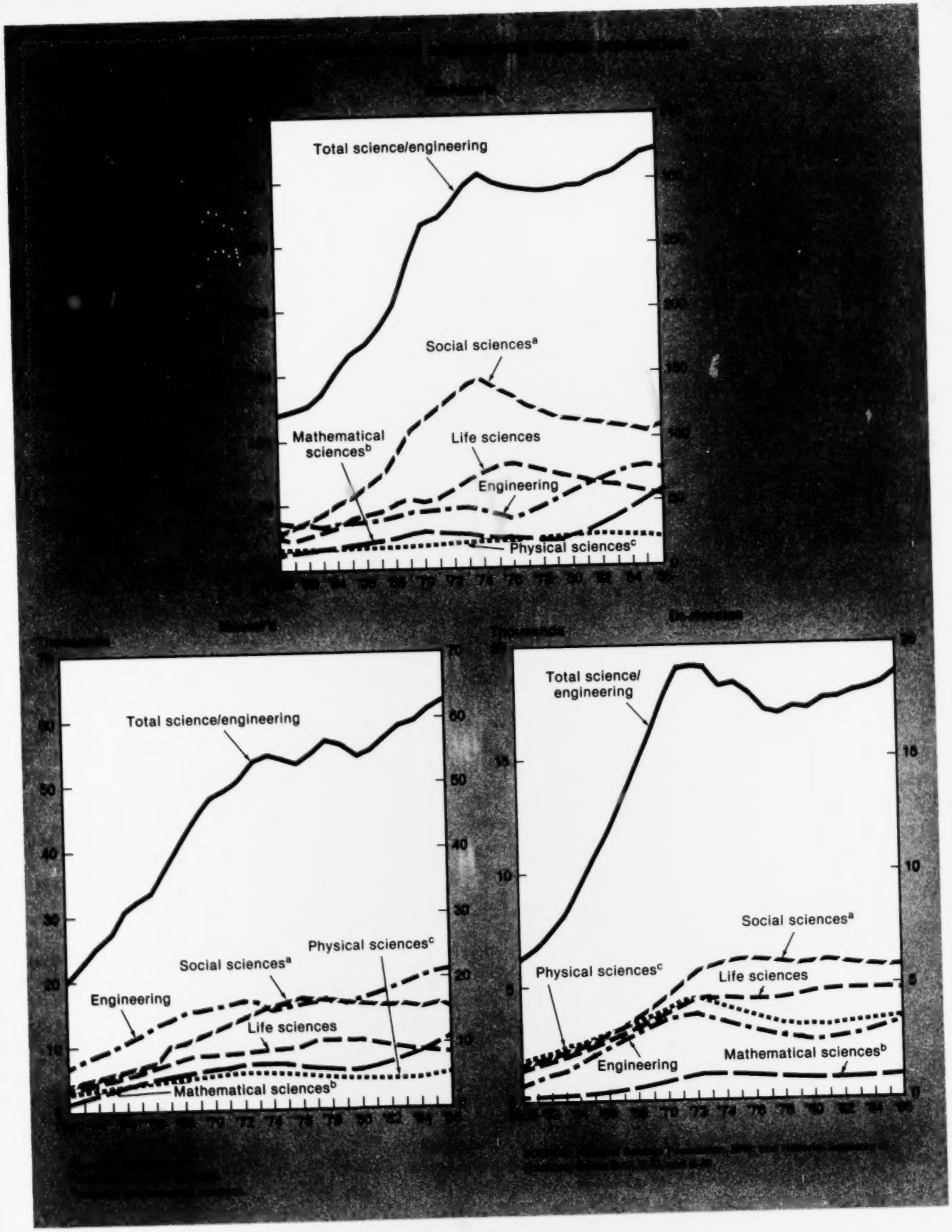
Annual production of S/E baccalaureates awarded in the United States had remained essentially level during the seventies (around 290,000 degrees); during the eighties, it is averaging about 2-percent annual growth. There were about 324,000 S/E bachelor's degrees awarded in 1986. Since 1980, the field distribution of S/E baccalaureates has changed significantly, favoring production of engineering and math science, including computer science degrees; degree production in the social and life sciences show the greatest decline (chart 21).

The number of S/E master's degrees increased steadily through the midseventies, declined somewhat in the late seventies, then rose sharply in 1982. By 1986, an all-time

[27]Michael Finn, *Foreign National Scientists and Engineers in the U.S. Labor Force, 1972–82* (Oak Ridge, Tenn.: Oak Ridge Associated Universities, 1985). See also footnote 26.

[28]National Science Foundation, *Women and Minorities in Science and Engineering* (NSF 86–301)(Washington, D.C., January 1986).

[29]Admissions Testing Program at the College Board, *Profiles, College-Bound Seniors, 1981–1985*, annual series (New York: College Entrance Examination Board).


Total science/engineering
Social sciences[a]
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Life sciences
Engineering
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Total science/engineering
Social sciences[a]
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Engineering
Life sciences
Mathematical sciences[b]
Total science/ engineering
Social sciences[a]
Physical sciences[c]
Life sciences
Engineering
Mathematical sciences[b]

high of more than 62,500 students graduated with master's degrees in S/E fields.

The number of S/E doctorates awarded peaked at 19,000 in 1972; it then declined steadily, leveling out at a little more than 17,000 in 1978. Since then, however, the number of S/E doctorate degrees has increased almost annually (chart 21). In 1986, roughly 18,000 S/E doctorates—59 percent of all doctorate degrees—were awarded. All of this growth is accounted for by rapid increases in the number of foreign graduate students receiving such degrees; the number of U.S. citizens receiving S/E doctorates has declined somewhat since 1978. Engineering (3,376 degrees in 1986) and the physical sciences (3,679) have contributed most significantly to the growth in S/E doctorates since 1982. The 7-percent increase in engineering doctorates reported for 1986 represented this field's sixth consecutive year of growth. Doctorates in the life sciences (4,790) declined somewhat, while the social sciences (5,818) and computer science (1,129) registered gains of 2 percent and 13 percent, respectively.

entry to the s/e labor market

Degree recipients are the major source of new supply to the S/E labor market. In measuring their contribution, however, it is important to take account not only of the number of new degrees granted, but also of the proportion of degree-holders who enter the labor market and ultimately find employment in S/E occupations. Leakages from the S/E supply are caused by numerous factors, including graduate school attendance, employment in non-S/E jobs, emigration of foreign student S/E graduates, and non-labor force participation.

In 1986, relatively few recent S/E graduates were unable to find employment. The unemployment rates for combined 1984–85 S/E graduates were uniformly low, ranging from an S/E low of 1.2 percent for recipients of engineering master's degrees to an S/E high of 3.9 percent for graduates with a bachelor's degree in science. Unemployment rates for master's-level science graduates and bachelor's-level engineering graduates were 2.6 percent and 2.4 percent, respectively.

The S/E employment rate (the proportion of employed S/E graduates in S/E jobs) varied considerably across fields and by degree level. Bachelor recipients in science fields had a 53-percent S/E employment rate, while students with a bachelor's degree in engineering had an 89-percent rate. Comparable rates for those with a master's degree were 84 percent in the sciences and 95 percent in engineering. More detailed data on S/E employment rates by field show that fewer than one-third of bachelor's and one-half of master's degree-holders in the social sciences were working in S/E jobs in 1986. This contrasts with 90-percent S/E employment rates for both bachelor's- and master's-degree recipients in computer science.

Substantial field mobility can be identified at labor market entry, a characteristic resulting from supply/demand adjustments and S/E personnel flexibility. In 1986, for example, 30 percent of the recent bachelor's and master's graduates working as computer specialists had not received their degrees in computer science. Rather, graduates in mathematics and engineering, responding to the job opportunities in computer specialties, accounted for the majority of influx from other S/E fields.

In 1986, roughly 20 percent of recent recipients of S/E bachelor's degrees were enrolled in full-time graduate programs; an additional 11 percent were enrolled on a part-time basis. Corresponding rates among master's degree-recipients were 21 percent and 9 percent, respectively. Graduate enrollment seems inversely related to employment demand. For example, relatively low graduate enrollment rates were observed in high-demand fields (e.g., the mathematic sciences, computer science, and engineering), compared to higher rates observed in such fields as the physical, life, and social sciences which show lower employment demand.

appendixes

a. technical notes
b. detailed statistical tables

appendix a

technical notes

basis for sectoring

The National Science Foundation follows a 4-sector division in surveying R&D funds and personnel and maintaining time series data on expenditures and employment:

Federal Government. This sector consists of the agencies of the Federal Government.

Industry. This sector consists of both manufacturing and nonmanufacturing companies. Manufacturing companies are classified by major industry groupings. Nonmanufacturing companies include those in selected services industries and are treated as a unit. Performance of federally funded research and development centers (FFRDCs) administered by industrial firms are included in industry totals. Industry funding of industry research and development includes all funds (e.g., from State and local governments) other than those received from Federal sources.

Universities and colleges. This sector consists of all institutions of higher education, both public and private. Expenditures of FFRDCs administered by universities and colleges are reported separately from totals for this sector. University funding of university research and development includes (1) State and local government funds separately budgeted for research and development, and (2) restricted or general funds that the institutions themselves have been free to allocate for research. Funds from the Federal Government, industry, or other nonprofit institutions, which are supplied in the form of grants or contracts for research and development at a university, are credited to the appropriate source. For example, research contracts from industry are treated as university performance funded by industry as the source. Funds given to the institution by industry for general educational purposes and used by the school, at its discretion, for research, are treated as university performance financed with the university's own funds.

Other nonprofit institutions. This sector consists of institutions that fall into two general groups: (1) organizations that are primarily granting in nature, namely private philanthropic foundations and voluntary health agencies, and (2) public and private organizations that are involved in performing research and development, including FFRDCs administered by nonprofit organizations.

definitions

Research and development in this report consists of basic and applied research in the sciences (including medical sciences) and in engineering and activities in development, all defined below.

In terms of fields, the Federal, university, and nonprofit sectors include the broad fields of life sciences, physical sciences, environmental sciences, mathematics and computer sciences, psychology, physical sciences, engineering, social sciences, and an all-inclusive other sciences category. Industry coverage is limited to (1) the physical sciences, including related engineering, and (2) the biological sciences, including medicine but excluding psychology: it specifically excludes research in the social sciences.

Basic research. Within the Federal, university, and nonprofit sectors, basic research is defined as research directed toward increases in knowledge or understanding of the subject under study without specific application toward processes or products in mind. The definition for the industry sector is modified to indicate that basic research projects represent "knowledge...which do not have specific commercial objectives, although they may be in fields of present or potential interest to the reporting company."

Applied research. Within the Federal, university, and nonprofit sectors, applied research is defined as research directed toward gaining "knowledge or understanding necessary for determining the means by which a recognized and specific need may be met." Here again, the applied research definition for the industry sector is modified to include ". . . research projects which represent investigations directed to discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes."

Development. The NSF survey definition of development is ". . . the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems or methods, including design and development of prototypes and processes."

current operating costs

Funds used for research and development, reported in this study, refer to current operating costs. They consist of both direct and indirect costs, including depreciation, insofar as this information is available to respondents. Capital expenditures are excluded by definition in the industry and universities and colleges sector surveys. Under the accounting practices of some Federal agencies, obligations for capital items may be included.

performer-reporting basis

In NSF surveys, respondents in all sectors indicate the amounts they spend on research and development in their own sector and the sources of these funds. All national totals are based on data as reported by performers because they are in the best position to: (1) indicate how much they spent in the actual conduct of research and development in a given year, (2) classify their work as basic, applied, etc., and (3) identify the sector of the economy in which their financing originated. The consistent use of performer reporting also reduces the possibility of double-counting.

Federal agency obligations are used to estimate intramural performance in agency laboratories and therefore are treated as the equivalent of expenditures. Such intramural activities cover costs associated with the planning and administration of intramural and extramural R&D programs by Federal personnel as well as actual intramural R&D performance.

In general, the Federal Government and industry have been surveyed every year; the university and college sector has been surveyed annually since 1972. It has not been possible to maintain the same survey frequency for other nonprofit institutions. The last complete survey was conducted in 1973. Since then, informal surveys of this sector have periodically been undertaken. Research and development performed by State and local governments is not included in the national totals.

Details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with R&D expenditure data are contained in the complete NSF sectoral reports on R&D funding.

use of time-series data

Data presented in trend tables are assembled from the most recently completed survey cycles. Data for prior years are reviewed for consistency with current-year's responses and, when necessary, revised in consultation with survey respondents. Consequently, references to data for prior years should be restricted to this document.

defense-space-civilian classification

Defense expenditures consist of all R&D spending by the Department of Defense (DOD) and defense-related atomic energy programs of the Department of Energy. Space R&D expenditures are those only of the National Aeronautics and Space Administration. The space activities of DOD are included as spending on defense. All industry-funded research and development is classified as civilian research and development, including expenditures by aerospace and electronic industries.

estimating procedure for 1987

Federal Government. Data are based on (1) changes shown in *Federal Funds for Research and Development: Fiscal Years 1986, 1987, and 1988 (Federal Funds)*, and (2) "Special Analysis J" on R&D spending in *The Budget of the United States Government, Fiscal Year 1988*.

Industry. Estimates are based on (1) Federal obligations reported in *Federal Funds*, (2) mail responses to an

annual NSF inquiry to its Industrial Panel on Science and Technology, and (3) interviews with R&D officials in the major R&D-performing industries. Respondents included 15 of the top 20 R&D-performing companies in the United States.

Universities and colleges. Estimates are based on (1) Federal obligations reported in *Federal Funds*, (2) extrapolations of recent trends for each of the non-Federal sources, and (3) a series of interviews with university survey respondents in which they were asked to give some indications of future R&D spending levels.

Other nonprofit institutions. Estimates are based on (1) Federal obligations reported in *Federal Funds*, (2) extrapolations of recent trends in R&D performance and funding within the industry and university sectors, and (3) an informal review of R&D expenditure trends expected by institutions in the nonprofit sector.

human resources

A variety of surveys and estimation techniques are used to gather information on the numbers and characteristics of persons engaged in science and engineering (S/E) activities in all sectors of the economy. In general, two concepts are used in reporting worker inputs for research and development: surveys directed at employers and surveys directed at individuals. The employer surveys focus on the amount of time—in terms of person-years—devoted to the performance and management of research and development. Surveys of the individual result in data which reflect the demographic, primary work activity, and economic characteristics of the respondents.

Details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with S/E personnel data are contained in the complete NSF reports on each aspect of the S/E labor force.

appendix b

detailed statistical tables

r&d resources

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Table B-1. Transfers of funds expended annually for performance of research and development by sector, distributed by source: selected years[1]

[Dollars in millions]

Year	Total	Federal Government		Industry[2]		Universities and colleges		Associated FFRDCs[3]		Other nonprofit institutions[2 4]	
		Total funds used		Total funds used		Total funds used		Total funds used		Total funds used	
1953	5,124	1,010		3,630		255		121		108	
1960	13,523	1,726		10,509		646		360		282	
1965	20,044	3,093		14,185		1,474		629		663	
1966	21,846	3,220		15,548		1,715		630		733	
1967	23,146	3,396		16,385		1,921		673		771	
1968	24,605	3,494		17,429		2,149		719		814	
1969	25,631	3,503		18,308		2,225		725		870	
1970	26,134	4,079		18,067		2,335		737		916	
1971	26,676	4,228		18,320		2,500		716		912	
1972	28,477	4,590		19,552		2,630		753		952	
1973	30,718	4,762		21,249		2,884		817		1,006	
1974	32,864	4,911		22,887		3,023		865		1,178	
1975	35,213	5,354		24,187		3,409		987		1,276	

Table B-1. Transfers of funds expended annually for performance of research and development by sector, distributed by source: selected years[1]—Con.

[Dollars in millions]

Year	Total	Federal Government		Industry[2]		Universities and colleges		Associated FFRDCs[3]		Other nonprofit institutions[2 4]	
		Total funds used		Total funds used		Total funds used		Total funds used		Total funds used	
1976	39,018	5,769		26,997		3,729		1,147		1,376	
1977	42,783	6,012		29,825		4,067		1,384		1,495	
1978	48,129	6,811		33,304		4,625		1,717		1,672	
1979	54,933	7,417		38,226		5,361		1,935		1,994	
1980	62,593	7,632		44,505		6,080		2,246		2,150	
1981	71,840	8,425		51,810		6,819		2,486		2,300	
1982	79,316	9,141		57,995		7,276		2,479		2,425	
1983	87,204	10,582		63,403		7,807		2,737		2,675	
1984	97,638	11,572		71,470		8,503		3,118		2,975	
1985	107,436	12,945		78,208		9,504		3,529		3,250	
1986 (est.)	114,697	13,535		83,562		10,600		3,600		3,400	
1987 (est.)	123,050	15,450		89,200		11,150		3,800		3,450	

[redacted]

[1]All data are based on reports by performers.

[2]Expenditures for federally funded research and development centers (FFRDCs) administered by both industry and by nonprofit institutions are included in the totals of the respective sectors.

[3]FFRDCs administered by individual universities and colleges and by university consortia.

[4]Data since 1973 have been estimated based on a survey conducted in that year.

[5]Distribution by non-Federal sources has been estimated for all years.

[6]Includes State and local government funds.

SOURCE: National Science Foundation, SRS

Table B-2. Transfers of funds expended annually for performance of basic research by sector, distributed by source: selected years[1]

[Dollars in millions]

Year	Total	Federal Government		Industry[2]			Universities and colleges				Associated FFRDCs[3]		Other nonprofit institutions[2 4]			
		Total funds used	Source	Total funds used	Source		Total funds used	Source			Total funds used	Source	Total funds used	Source		
			Federal Government		Federal Government	Other sources		Federal Government	Industry	Other non-profit institutions		Federal Government		Federal Government	Industry	Other non-profit institutions
1953	441	101		151			110				33		46			
1960	1,197	160		376			433				97		131			
1965	2,555	364		592			1,138				208		253			
1966	2,814	385		624			1,303				227		275			
1967	3,056	435		629			1,457				250		285			
1968	3,296	432		642			1,649				276		297			
1969	3,441	532		618			1,711				275		305			
1970	3,549	577		602			1,796				269		305			
1971	3,672	586		590			1,914				260		322			
1972	3,829	625		593			2,022				244		345			
1973	3,946	608		631			2,053				297		357			
1974	4,239	696		699			2,154				285		405			
1975	4,608	734		730			2,410				309		425			

Table B-2. Transfers of funds expended annually for performance of basic research by sector, distributed by source: selected years[1]—Con.

[Dollars in millions]

Year	Total	Federal Government		Industry[2]			Universities and colleges				Associated FFRDCs[3]		Other nonprofit institutions[2,4]			
			Source		Source			Source[5]				Source		Source		
		Total funds used	Federal Government	Total funds used	Federal Government	Industry[6]	Total funds used	Federal Government			Other non-profit institutions[6]	Total funds used	Federal Government	Total funds used	Federal Government	Industry	Other non-profit institutions[6]
1976	4,977	786	786	819	469	350	2,549	1,341	71	792	109	359	359	464	385	54	105
1977	5,537	914	914	911	509	402	2,800	1,500	72	827	127	402	402	510	397	73	105
1978	6,392	1,029	1,029	1,035	580	455	3,176	1,694	84	931	167	567	567	585	385	83	117
1979	7,257	1,089	1,089	1,158	642	516	3,612	2,070	114	1,035	277	718	718	680	430	85	165
1980	8,079	1,182	1,182	1,325	725	600	4,026	2,355	127	1,049	296	786	786	760	430	3	327
1981	9,180	1,302	1,302	1,614	901	713	4,576	2,650	179	1,207	540	863	863	825	455	165	205
1982	9,937	1,465	1,465	1,880	980	900	4,867	3,396	199	1,181	391	870	870	865	535	115	215
1983	11,039	1,690	1,690	2,152	490	1,662	5,269	3,836	236	1,144	309	983	983	945	800	125	020
1984	12,036	1,861	1,861	2,475	471	2,004	5,638	3,782	279	1,214	363	1,052	1,052	1,010	650	135	225
1985	13,081	1,923	1,923	2,678	476	2,152	6,377	4,235	345	1,382	415	1,078	1,078	1,075	695	150	230
1986 (est.)	14,163	2,019	2,019	2,794	524	2,270	7,100	4,700	376	1,630	345	1,150	1,150	1,100	680	170	240
1987 (est.)	14,950	2,220	2,220	3,000	600	2,400	7,370	4,920	390	1,500	460	1,200	1,200	1,160	730	180	250

[1]All data are based on reports by performers.

[2]Expenditures for federally funded research and development centers (FFRDCs) administered by both industry and by nonprofit institutions are included in the totals of the respective sectors.

[3]FFRDCs administered by individual universities and colleges and by university consortia.

[4]Data since 1973 have been estimated based on a survey conducted in that year.

[5]Distribution by non-Federal sources has been estimated for all years.

[6]Includes State and local government funds.

SOURCE: National Science Foundation, SRS

Table B-3. Transfers of funds expended annually for performance of applied research by sector, distributed by source: selected years[1]

[Dollars in millions]

Year	Total	Federal Government		Industry[2]		Universities and colleges		Associated FFRDCs[3]		Other nonprofit institutions[4]	
		Total funds used		Total funds used		Total funds used		Total funds used		Total funds used	
1953.....	1,279	345		726		130		44		34	
1960.....	3,020	595		2,029		179		122		95	
1965.....	4,339	990		2,658		279		204		208	
1966.....	4,601	997		2,843		328		207		226	
1967.....	4,780	1,027		2,915		374		219		245	
1968.....	5,131	1,110		3,124		404		231		262	
1969.....	5,316	1,114		3,287		407		210		298	
1970.....	5,720	1,327		3,427		427		216		323	
1971.....	5,739	1,302		3,415		474		210		338	
1972.....	5,984	1,360		3,514		524		221		365	
1973.....	6,597	1,480		3,825		713		226		353	
1974.....	7,228	1,574		4,268		736		217		413	
1975.....	7,863	1,730		4,570		851		264		448	

Table B-3. Transfers of funds expended annually for performance of applied research by sector, distributed by source: selected years[1]

[Dollars in millions]

Year	Total	Federal Government		Industry[2]		Universities and colleges		Associated FFRDCs[3]		Other nonprofit institutions[4]	
		Total funds used		Total funds used		Total funds used		Total funds used		Total funds used	
1976	9,046	2,093		5,112		1,016		327		498	
1977	9,745	2,044		5,636		1,067		465		533	
1978	10,844	2,192		6,300		1,213		549		590	
1979	12,372	2,392		7,225		1,465		580		710	
1980	14,050	2,484		8,450		1,691		700		725	
1981	16,877	2,732		10,699		1,866		800		780	
1982	18,518	2,729		12,175		2,004		795		815	
1983	20,351	3,020		13,505		2,101		850		875	
1984	22,186	2,903		15,028		2,390		950		915	
1985	24,632	3,133		16,911		2,572		1,066		950	
1986 (est.)	24,752	3,141		16,711		2,900		1,050		950	
1987 (est.)	26,010	3,315		17,550		3,080		1,100		965	

[1]All data are based on reports by performers.

[2]Expenditures for federally funded research and development centers (FFRDCs) administered by both industry and by nonprofit institutions are included in the totals of the respective sectors.

[3]FFRDCs administered by individual universities and colleges and by university consortia.

[4]Data since 1973 have been estimated based on a survey conducted in that year.

[5]Distribution by non-Federal sources has been estimated for all years.

[6]Includes State and local government funds.

SOURCE: National Science Foundation, SRS

Table B-4. Transfers of funds expended annually for performance of development by sector, distributed by source: selected years[1]

[Dollars in millions]

Year	Total	Federal Government		Industry[2]			Universities and colleges					Associated FFRDCs[3]		Other nonprofit institutions[2,4]			
		Total funds used	Source	Total funds used	Source		Total funds used	Source				Total funds used	Source	Total funds used	Source		
			Federal Government		Federal Government	Industry[2]		Federal Government			Other non-profit institutions		Federal Government		Federal Government	Industry	Other non-profit institutions
1953	3,404	564		2,753			15					44		28			
			564		2,753			15					44		28		
1960	9,306	971		8,104			34					141		56			
			971		8,104			34					141		56		
1965	13,150	1,739		10,935			57					217		202			
			1,739		10,935			57					217		202		
1966	14,431	1,838		12,081			84					196		232			
			1,838		12,081			84					196		232		
1967	15,310	1,934		12,841			90					204		241			
			1,934		12,841			90					204		241		
1968	16,178	1,952		13,663			96					212		255			
			1,952		13,663			96					212		255		
1969	16,874	1,857		14,403			107					240		267			
			1,857		14,403			107					240		267		
1970	16,865	2,175		14,038			112					252		288			
			2,175		14,038			112					252		288		
1971	17,265	2,340		14,315			112					248		252			
			2,340		14,315			112					248		252		
1972	18,664	2,605		15,445			84					288		242			
			2,605		15,445			84					288		242		
1973	20,175	2,674		16,793			118					294		296			
			2,674		16,793			118					294		296		
1974	21,397	2,641		17,900			133					363		360			
			2,641		17,900			133					363		360		
1975	22,742	2,890		18,887			148					414		403			
			2,890		18,887			148					414		403		

Table B-4. Transfers of funds expended annually for performance of development by sector, distributed by source: selected years[1]

[Dollars in millions]

Year	Total	Federal Government		Industry[2]			Universities and colleges				Associated FFRDCs[3]		Other nonprofit institutions[2 4]			
		Total funds used	Source	Total funds used	Source		Total funds used	Source			Total funds used	Source	Total funds used	Source		
			Federal Government		Federal Government	Other[5]		Federal Government	Industry	Other nonprofit institutions		Federal Government		Federal Government	Industry	Other nonprofit institutions
1976	24,995	2,890		21,066			164				461		414			
1977	27,501	3,054		23,278			200				517		452			
1978	30,893	3,590		25,969			236				601		497			
1979	35,304	3,936		29,843			284				637		604			
1980	40,464	3,966		34,730			343				760		665			
1981	45,783	4,391		39,497			377				823		695			
1982	50,861	4,947		43,940			415				814		745			
1983	55,814	5,872		47,746			437				904		855			
1984	63,416	6,808		53,967			475				1,116		1,050			
1985	69,723	7,889		58,669			555				1,385		1,225			
1986 (est.)	75,782	8,375		64,051			600				1,400		1,350			
1987 (est.)	82,090	9,915		68,650			700				1,500		1,325			

[1]All data are based on reports by performers.

[2]Expenditures for federally funded research and development centers (FFRDCs) administered by both industry and by nonprofit institutions are included in the totals of the respective sectors.

[3]FFRDCs administered by individual universities and colleges and by university consortia.

[4]Data since 1973 have been estimated based on a survey conducted in that year.

[5]Distribution by non-Federal sources has been estimated for all years.

[6]Includes State and local government funds.

SOURCE: National Science Foundation, SRS

Table B-5. Sources of funds for research and development by sector

[Dollars in millions]

Current dollars

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	$ 5,124	$ 2,753	$ 2,245	$ 72	$ 54
1960	13,523	8,738	4,516	149	120
1965	20,044	13,012	6,548	267	217
1966	21,846	13,968	7,328	304	246
1967	23,146	14,395	8,142	345	264
1968	24,605	14,928	9,005	390	282
1969	25,631	14,895	10,010	420	306
1970	26,134	14,892	10,444	461	337
1971	26,676	14,964	10,822	529	361
1972	28,477	15,808	11,710	574	385
1973	30,718	16,399	13,293	613	413
1974	32,864	16,850	14,878	677	459
1975	35,213	18,109	15,820	749	535
1976	39,018	19,914	17,694	810	600
1977	42,783	21,594	19,629	888	672
1978	48,129	23,876	22,450	1,037	766
1979	54,933	26,815	26,082	1,198	838
1980	62,593	29,453	30,913	1,318	909
1981	71,840	33,405	35,944	1,520	971
1982	79,316	36,505	40,096	1,690	1,025
1983	87,204	40,671	43,515	1,881	1,137
1984	97,638	45,340	49,066	2,024	1,208
1985	107,436	51,276	52,597	2,259	1,304
1986	114,697	55,273	55,549	2,500	1,375
1987	123,050	60,350	58,570	2,700	1,430

Constant (1982) dollars[1]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	$ 19,744	$10,590	$ 8,671	$ 276	$ 208
1960	43,648	28,191	14,591	479	387
1965	59,351	38,532	19,384	791	643
1966	62,589	40,047	20,962	875	706
1967	64,406	40,057	22,654	960	735
1968	65,458	39,788	23,869	1,049	752
1969	64,672	37,660	25,166	1,071	775
1970	62,405	35,636	24,851	1,111	807
1971	60,385	33,966	24,387	1,212	820
1972	61,414	34,146	25,190	1,246	832
1973	62,427	33,478	26,837	1,268	844
1974	61,467	31,726	27,578	1,298	865
1975	59,883	30,986	26,679	1,302	916
1976	62,134	31,813	28,058	1,305	959
1977	63,653	32,152	29,176	1,325	1,001
1978	66,769	33,172	31,087	1,446	1,064
1979	70,077	34,271	33,198	1,538	1,071
1980	73,235	34,548	36,066	1,555	1,066
1981	76,610	35,685	38,257	1,631	1,037
1982	79,316	36,505	40,096	1,690	1,025
1983	83,891	39,097	41,896	1,805	1,093
1984	90,541	42,007	45,544	1,871	1,119
1985	96,532	46,030	47,310	2,023	1,170
1986	100,398	48,318	48,702	2,177	1,201
1987	104,345	51,154	49,693	2,286	1,212

[1]Based on GNP implicit price deflator.

SOURCE: National Science Foundation, SRS

Table B-6. Research and development performance by sector

[Dollars in millions]

Current dollars

Year	Total	Federal Government	Industry	Universities and colleges	Associated FFRDCs	Other nonprofit institutions
1953	$ 5,124	$ 1,010	$ 3,630	$ 255	$ 121	$ 108
1960	13,523	1,726	10,509	646	360	282
1965	20,044	3,093	14,185	1,474	629	663
1966	21,846	3,220	15,548	1,715	630	733
1967	23,146	3,396	16,385	1,921	673	771
1968	24,605	3,494	17,429	2,149	719	814
1969	25,631	3,503	18,308	2,225	725	870
1970	26,134	4,079	18,067	2,335	737	916
1971	26,676	4,228	18,320	2,500	716	912
1972	28,477	4,590	19,552	2,630	753	952
1973	30,718	4,762	21,249	2,884	817	1,006
1974	32,864	4,911	22,887	3,023	865	1,178
1975	35,213	5,354	24,187	3,409	987	1,276
1976	39,018	5,769	26,997	3,729	1,147	1,376
1977	42,783	6,012	29,825	4,067	1,384	1,495
1978	48,129	6,811	33,304	4,625	1,717	1,672
1979	54,933	7,417	38,226	5,361	1,935	1,994
1980	62,593	7,632	44,505	6,060	2,246	2,150
1981	71,840	8,425	51,810	6,819	2,486	2,300
1982	79,316	9,141	57,995	7,276	2,479	2,425
1983	87,204	10,582	63,403	7,807	2,737	2,675
1984	97,638	11,572	71,470	8,503	3,118	2,975
1985	107,436	12,945	78,208	9,504	3,529	3,250
1986	114,697	13,535	83,562	10,600	3,600	3,400
1987	123,050	15,540	89,200	11,150	3,800	3,450

Constant (1982) dollars[1]

Year	Total	Federal Government	Industry	Universities and colleges	Associated FFRDCs	Other nonprofit institutions
1953	$ 19,744	$ 3,867	$14,021	$ 976	$ 463	$ 417
1960	43,648	5,548	33,955	2,077	1,157	911
1965	59,351	9,164	41,992	4,367	1,864	1,963
1966	62,589	9,269	44,474	4,937	1,813	2,097
1967	64,406	9,452	45,590	5,347	1,873	2,145
1968	65,458	9,395	46,194	5,778	1,933	2,157
1969	64,672	8,936	46,023	5,676	1,849	2,187
1970	62,405	9,834	42,986	5,629	1,777	2,179
1971	60,385	9,684	41,280	5,726	1,640	2,055
1972	61,414	9,965	42,056	5,710	1,635	2,048
1973	62,427	9,849	42,893	5,965	1,690	2,031
1974	61,467	9,415	42,415	5,796	1,658	2,183
1975	59,883	9,308	40,781	5,927	1,716	2,151
1976	62,134	9,293	42,805	6,007	1,848	2,182
1977	63,653	8,969	44,330	6,067	2,065	2,222
1978	66,769	9,497	46,115	6,449	2,394	2,315
1979	70,077	9,521	48,652	6,882	2,484	2,538
1980	73,235	9,006	51,919	7,151	2,650	2,508
1981	76,610	9,039	55,140	7,316	2,667	2,448
1982	79,316	9,141	57,995	7,276	2,479	2,425
1983	83,891	10,153	61,047	7,490	2,626	2,576
1984	90,541	10,696	66,342	7,859	2,882	2,762
1985	96,532	11,590	70,350	8,509	3,160	2,923
1986	100,398	11,785	73,268	9,229	3,135	2,981
1987	104,345	13,079	75,683	9,439	3,217	2,927

[1]Based on GNP implicit price deflator.

SOURCE: National Science Foundation, SRS

Table B-7. Sources of funds for basic research by sector

[Dollars in millions]

Current dollars

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	$ 441	$ 251	$ 153	$ 10	$ 27
1960	1,197	715	342	72	68
1965	2,555	1,809	461	164	121
1966	2,814	1,978	510	197	129
1967	3,056	2,201	492	223	140
1968	3,296	2,336	535	276	149
1969	3,441	2,441	540	298	162
1970	3,549	2,489	528	350	182
1971	3,672	2,529	547	400	196
1972	3,829	2,633	563	415	218
1973	3,946	2,709	605	408	224
1974	4,239	2,912	651	432	244
1975	4,608	3,139	705	478	286
1976	4,977	3,436	769	475	297
1977	5,537	3,823	850	527	337
1978	6,392	4,445	964	605	378
1979	7,257	5,044	1,092	709	412
1980	8,079	5,561	1,267	800	451
1981	9,180	6,211	1,588	906	475
1982	9,937	6,646	1,813	982	496
1983	11,039	7,271	2,045	1,144	579
1984	12,036	7,816	2,418	1,214	588
1985	13,801	8,427	2,647	1,362	645
1986	14,163	9,133	2,815	1,530	685
1987	14,950	9,670	2,970	1,600	710

Constant (1982) dollars[1]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	$ 1,695	$ 962	$ 591	$ 38	$104
1960	3,856	2,301	1,105	231	219
1965	7,568	5,359	1,365	486	358
1966	8,084	5,687	1,459	567	370
1967	8,505	6,125	1,369	621	390
1968	8,826	6,267	1,419	742	398
1969	8,744	6,214	1,359	760	411
1970	8,527	5,990	1,258	844	436
1971	8,377	5,780	1,234	916	446
1972	8,294	5,710	1,212	901	472
1973	8,112	5,586	1,224	844	459
1974	8,056	5,557	1,210	828	461
1975	7,951	5,436	1,192	831	491
1976	7,985	5,523	1,221	765	475
1977	8,253	5,701	1,264	786	502
1978	8,897	6,192	1,336	844	525
1979	9,296	6,468	1,391	910	527
1980	9,506	6,552	1,480	944	529
1981	9,828	6,657	1,692	972	508
1982	9,937	6,646	1,813	982	496
1983	10,602	6,980	1,968	1,098	556
1984	11,139	7,229	2,243	1,122	544
1985	11,727	7,550	2,380	1,219	578
1986	12,356	7,960	2,466	1,332	598
1987	12,664	8,188	2,519	1,354	602

[1]Based on GNP implicit price deflator.

SOURCE: National Science Foundation, SRS

Table B-8. Basic research performance by sector

[Dollars in millions]

Current Dollars

Year	Total	Federal Government	Industry	Universities and colleges	Associated FFRDCs	Other nonprofit institutions
1953	$ 441	$ 101	$ 151	$ 110	$ 33	$ 46
1960	1,197	160	376	433	97	131
1965	2,555	364	592	1,138	208	253
1966	2,814	385	624	1,303	227	275
1967	3,056	435	629	1,457	250	285
1968	3,296	432	642	1,649	276	297
1969	3,441	532	618	1,711	275	305
1970	3,549	577	602	1,796	269	305
1971	3,672	586	590	1,914	260	322
1972	3,829	625	593	2,022	244	345
1973	3,946	608	631	2,053	297	357
1974	4,239	696	699	2,154	285	405
1975	4,608	734	730	2,410	309	425
1976	4,977	786	819	2,549	359	464
1977	5,537	914	911	2,800	402	510
1978	6,392	1,029	1,035	3,176	567	585
1979	7,257	1,089	1,158	3,612	718	680
1980	8,079	1,182	1,325	4,026	786	760
1981	9,180	1,302	1,614	4,576	863	825
1982	9,937	1,465	1,880	4,857	870	865
1983	11,039	1,690	2,152	5,269	983	945
1984	12,036	1,861	2,475	5,638	1,052	1,010
1985	13,081	1,923	2,628	6,377	1,078	1,075
1986	14,163	2,019	2,794	7,100	1,150	1,100
1987	14,950	2,220	3,000	7,370	1,200	1,160

Constant (1982) dollars[1]

Year	Total	Federal Government	Industry	Universities and colleges	Associated FFRDCs	Other nonprofit institutions
1953	$ 1,695	$ 387	$ 583	$ 421	$ 126	$178
1960	3,856	514	1,215	1,392	312	423
1965	7,568	1,079	1,753	3,372	616	749
1966	8,084	1,108	1,785	3,751	653	787
1967	8,505	1,211	1,750	4,055	696	793
1968	8,826	1,162	1,702	4,434	742	787
1969	8,744	1,357	1,554	4,365	702	767
1970	8,527	1,391	1,432	4,330	649	726
1971	8,377	1,342	1,329	4,384	596	726
1972	8,294	1,357	1,276	4,390	530	742
1973	8,112	1,257	1,274	4,246	614	721
1974	8,056	1,334	1,295	4,130	546	751
1975	7,951	1,276	1,231	4,190	537	717
1976	7,985	1,266	1,299	4,106	578	736
1977	8,253	1,364	1,354	4,177	600	758
1978	8,897	1,435	1,433	4,428	791	810
1979	9,296	1,398	1,474	4,637	922	865
1980	9,506	1,395	1,546	4,751	928	887
1981	9,828	1,397	1,718	4,909	926	878
1982	9,937	1,465	1,880	4,857	870	865
1983	10,602	1,621	2,072	5,055	943	910
1984	11,139	1,720	2,297	5,211	972	938
1985	11,727	1,722	2,364	5,710	965	967
1986	12,356	1,758	2,450	6,182	1,001	964
1987	12,664	1,879	2,545	6,239	1,016	984

[1]Based on GNP implicit price deflator.

SOURCE: National Science Foundation, SRS

Table B-9. Sources of funds for applied research by sector

[Dollars in millions]

Current dollars

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	$ 1,279	$ 747	$ 455	$ 57	$ 20
1960	3,020	1,688	1,226	66	40
1965	4,339	2,524	1,654	88	73
1966	4,601	2,582	1,841	89	89
1967	4,780	2,694	1,889	102	95
1968	5,131	2,810	2,125	97	99
1969	6,316	2,785	2,320	105	106
1970	5,720	3,080	2,427	98	115
1971	5,739	3,008	2,494	115	122
1972	5,984	3,104	2,615	140	125
1973	6,597	3,394	2,891	172	140
1974	7,228	3,534	3,332	203	159
1975	7,863	3,940	3,517	224	182
1976	9,046	4,534	4,003	283	226
1977	9,745	4,786	4,410	303	246
1978	10,844	5,229	4,981	354	280
1979	12,372	5,870	5,794	404	304
1980	14,050	6,599	6,695	428	328
1981	16,877	7,474	8,529	513	361
1982	18,518	8,135	9,416	588	379
1983	20,351	9,244	10,103	611	393
1984	22,186	9,971	11,095	680	440
1985	24,632	11,449	11,962	752	469
1986	24,752	10,862	12,590	810	490
1987	26,010	11,300	13,290	910	510

Constant (1982) dollars[1]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	$ 4,922	$ 2,870	$ 1,757	$218	$ 77
1960	9,743	5,441	3,961	212	129
1965	12,849	7,475	4,896	261	216
1966	13,189	7,411	5,266	256	255
1967	13,301	7,497	5,256	284	264
1968	13,666	7,509	5,633	261	264
1969	13,428	7,059	5,833	268	268
1970	13,671	7,385	5,775	236	275
1971	13,005	6,845	5,620	263	277
1972	12,914	6,715	5,625	304	270
1973	13,437	6,959	5,837	356	285
1974	13,557	6,692	6,177	389	299
1975	13,407	6,775	5,932	389	311
1976	14,430	7,265	6,348	456	361
1977	14,504	7,131	6,555	452	366
1978	15,053	7,273	6,898	494	389
1979	15,795	7,513	7,375	519	388
1980	16,456	7,755	7,811	505	385
1981	18,008	7,994	9,078	550	386
1982	18,518	8,135	9,416	588	379
1983	19,574	8,883	9,727	586	378
1984	20,569	9,235	10,298	629	408
1985	22,129	10,275	10,759	673	421
1986	21,659	9,488	11,038	705	428
1987	22,054	9,576	11,276	770	432

[1]Based on GNP implicit price deflator.

SOURCE: National Science Foundation, SRS

Table B-10. Applied research performance by sector

[Dollars in millions]

Current dollars

Year	Total	Federal Government	Industry	Universities and colleges	Associated FFRDCs	Other nonprofit institutions
1953	$ 1,279	$ 345	$ 726	$ 130	$ 44	$ 34
1960	3,020	595	2,029	179	122	95
1965	4,339	990	2,658	279	204	208
1966	4,601	997	2,843	328	207	226
1967	4,780	1,027	2,915	374	219	245
1968	5,131	1,110	3,124	404	231	262
1969	5,316	1,114	3,287	407	210	298
1970	5,720	1,327	3,427	427	216	323
1971	5,739	1,302	3,415	474	210	338
1972	5,984	1,360	3,514	524	221	365
1973	6,597	1,480	3,825	713	226	353
1974	7,228	1,574	4,288	736	217	413
1975	7,863	1,730	4,570	851	264	448
1976	9,046	2,093	5,112	1,016	327	498
1977	9,745	2,044	5,636	1,067	465	533
1978	10,844	2,192	6,300	1,213	549	590
1979	12,372	2,392	7,225	1,465	580	710
1980	14,050	2,484	8,450	1,691	700	725
1981	16,877	2,732	10,699	1,866	800	780
1982	18,518	2,729	12,175	2,004	795	815
1983	20,351	3,020	13,505	2,101	850	875
1984	22,186	2,903	15,028	2,390	950	915
1985	24,632	3,133	16,911	2,572	1,066	950
1986	24,752	3,141	16,711	2,900	1,050	950
1987	26,010	3,315	17,550	3,080	1,100	965

Constant (1982) dollars[1]

Year	Total	Federal Government	Industry	Universities and colleges	Associated FFRDCs	Other nonprofit institutions
1953	$ 4,922	$1,321	$ 2,804	$ 498	$168	$131
1960	9,743	1,913	6,556	575	392	307
1965	12,849	2,933	7,869	827	604	616
1966	13,189	2,870	8,132	944	596	646
1967	13,301	2,858	8,111	1,041	610	682
1968	13,666	2,985	8,280	1,086	621	694
1969	13,428	2,842	8,263	1,038	536	749
1970	13,671	3,199	8,154	1,029	521	768
1971	13,005	2,982	7,695	1,086	481	762
1972	12,914	2,953	7,559	1,138	480	785
1973	13,437	3,061	7,721	1,475	467	713
1974	13,557	3,018	7,947	1,411	416	765
1975	13,407	3,008	7,705	1,479	459	755
1976	14,430	3,371	8,105	1,637	527	790
1977	14,504	3,049	8,377	1,592	694	792
1978	15,053	3,056	8,723	1,691	765	817
1979	15,795	3,071	9,196	1,881	745	904
1980	16,456	2,931	9,858	1,996	826	846
1981	18,008	2,931	11,387	2,002	858	830
1982	18,518	2,729	12,175	2,004	795	815
1983	19,574	2,897	13,003	2,016	816	842
1984	20,569	2,683	13,950	2,209	878	849
1985	22,129	2,805	15,212	2,303	954	855
1986	21,659	2,735	14,652	2,525	914	833
1987	22,054	2,806	14,891	2,607	931	819

[1]Based on GNP implicit price deflator.

SOURCE: National Science Foundation, SRS

Table B-11. Sources of funds for development by sector

[Dollars in millions]

Current dollars

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	$ 3,404	$ 1,755	$ 1,637	$ 5	$ 7
1960	9,306	6,335	2,948	11	12
1965	13,150	8,679	4,433	15	23
1966	14,431	9,408	4,977	18	28
1967	15,310	9,500	5,761	20	29
1968	16,178	9,782	6,345	17	34
1969	16,874	9,669	7,150	17	38
1970	16,865	9,323	7,489	13	40
1971	17,265	9,427	7,781	14	43
1972	18,664	10,071	8,532	19	42
1973	20,175	10,296	9,797	33	49
1974	21,397	10,404	10,895	42	56
1975	22,742	11,030	11,568	47	67
1976	24,995	11,944	12,922	52	77
1977	27,501	12,985	14,369	58	89
1978	30,893	14,202	16,505	78	108
1979	35,304	15,901	19,196	85	122
1980	40,464	17,293	22,951	90	130
1981	45,783	19,720	25,827	101	135
1982	50,861	21,724	28,867	120	150
1983	55,814	24,156	31,367	126	165
1984	63,416	27,553	35,553	130	180
1985	69,723	31,400	37,988	145	190
1986	75,782	35,278	40,144	160	200
1987	82,090	39,380	42,310	190	210

Constant (1982) dollars[1]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	$13,127	$ 6,758	$ 6,323	$ 19	$ 27
1960	30,049	20,450	9,525	35	39
1965	38,934	25,698	13,123	44	68
1966	41,317	26,949	14,236	52	80
1967	42,601	26,435	16,029	56	81
1968	42,965	26,012	16,817	46	90
1969	42,500	24,387	17,974	43	96
1970	40,206	22,261	17,818	31	95
1971	39,003	21,341	17,533	32	97
1972	40,206	21,722	18,352	41	90
1973	40,878	20,934	19,776	68	99
1974	39,854	19,478	20,191	81	105
1975	38,525	18,775	19,555	82	114
1976	39,719	19,025	20,489	84	122
1977	40,896	19,320	21,357	87	132
1978	42,819	19,707	22,854	109	150
1979	44,986	20,290	24,432	109	156
1980	47,273	20,240	26,775	106	152
1981	48,774	21,034	27,487	108	144
1982	50,861	21,724	28,867	120	150
1983	53,715	23,234	30,201	121	159
1984	58,833	25,544	33,002	120	167
1985	62,676	28,205	34,171	130	171
1986	66,383	30,870	35,198	139	175
1987	69,627	33,390	35,898	161	178

[1]Based on GNP implicit price deflator.

SOURCE: National Science Foundation, SRS

Table B-12. Development performance by sector

[Dollars in millions]

Current dollars

Year	Total	Federal Government	Industry	Universities and colleges	Associated FFRDCs	Other nonprofit institutions
1953	$ 3,404	$ 564	$ 2,753	$ 15	$ 44	$ 28
1960	9,306	971	8,104	34	141	56
1965	13,150	1,739	10,935	57	217	202
1966	14,431	1,838	12,081	84	196	232
1967	15,310	1,934	12,841	90	204	241
1968	16,178	1,952	13,663	96	212	255
1969	16,874	1,857	14,403	107	240	267
1970	16,865	2,175	14,038	112	252	288
1971	17,265	2,340	14,315	112	246	252
1972	18,664	2,605	15,445	84	288	242
1973	20,175	2,674	16,793	118	294	296
1974	21,397	2,641	17,900	133	363	360
1975	22,742	2,890	18,887	148	414	403
1976	24,995	2,890	21,066	164	461	414
1977	27,501	3,054	23,278	200	517	452
1978	30,893	3,590	25,969	236	601	497
1979	35,304	3,936	29,843	284	637	604
1980	40,464	3,966	34,730	343	760	665
1981	45,783	4,391	39,497	377	823	695
1982	50,861	4,947	43,940	415	814	745
1983	55,814	5,872	47,746	437	904	855
1984	63,416	6,808	53,967	475	1,116	1,050
1985	69,723	7,889	58,669	555	1,385	1,225
1986	75,782	8,375	64,057	600	1,400	1,350
1987	82,090	9,915	68,650	700	1,500	1,325

Constant (1982) dollars[1]

Year	Total	Federal Government	Industry	Universities and colleges	Associated FFRDCs	Other nonprofit institutions
1953	$13,127	$2,159	$10,633	$ 57	$ 168	$ 108
1960	30,049	3,121	26,184	109	453	181
1965	38,934	5,153	32,371	169	643	598
1966	41,317	5,291	34,557	242	564	664
1967	42,601	5,383	35,729	250	568	671
1968	42,965	5,249	36,213	258	570	676
1969	42,500	4,737	36,207	273	612	671
1970	40,206	5,243	33,400	270	608	685
1971	39,003	5,360	32,256	257	563	568
1972	40,206	5,656	33,222	182	625	521
1973	40,878	5,531	33,898	244	608	597
1974	39,854	5,063	33,173	255	696	667
1975	38,525	5,024	31,845	257	720	679
1976	39,719	4,655	33,401	264	743	656
1977	40,896	4,556	34,599	298	771	672
1978	42,819	5,006	35,958	329	838	688
1979	44,986	5,053	37,983	365	818	769
1980	47,273	4,680	40,516	405	897	776
1981	48,774	4,711	42,036	404	883	740
1982	50,861	4,947	43,940	415	814	745
1983	53,715	5,634	45,972	419	867	823
1984	58,833	6,293	50,095	439	1,032	975
1985	62,676	7,063	52,774	497	1,240	1,102
1986	66,383	7,292	56,166	522	1,219	1,184
1987	69,627	8,393	58,247	593	1,270	1,124

[1]Based on GNP implicit price deflator.

SOURCE: National Science Foundation, SRS

Table B-13. Trends in Federal and non-Federal R&D outlays: 1953 and 1960–87

[Percents]

Year	Federal				Non-Federal
	Total	Defense related	Space related	Civilian related	
1953	54%	48%	1%	5%	46%
1960	65	52	3	9	35
1961	65	50	6	9	35
1962	64	48	7	9	36
1963	66	41	14	11	34
1964	66	37	19	9	34
1965	65	33	21	11	35
1966	64	33	19	12	36
1967	62	35	14	13	38
1968	61	35	13	13	39
1969	58	34	11	13	42
1970	57	33	10	14	43
1971	56	32	9	15	44
1972	56	32	9	15	44
1973	53	30	8	15	47
1974	51	27	8	16	49
1975	51	26	8	17	49
1976	51	26	8	17	49
1977	50	25	8	17	50
1978	50	24	7	19	50
1979	49	23	7	19	51
1980	47	22	7	18	53
1981	46	23	7	16	54
1982	46	25	7	14	54
1983	47	27	7	13	53
1984	46	28	6	12	54
1985	48	31	5	12	52
1986 (est.)	48	32	4	12	52
1987 (est.)	49	33	4	12	51

NOTE: Because of rounding, detail may not add to 100.
SOURCE: National Science Foundation, SRS

Table B-14. Full-time-equivalent (FTE) scientists and engineers employed in research and development by sector: selected years[1]

[In thousands]

Sector	1954	1961	1965	1969	1972	1975	1978	1981	1982	1983	1984	1985	1986[2]
Total	237.1	425.7	494.6	553.2	515.3	527.7	587.0	683.7	702.8	722.9	746.3	772.5	802.3
Federal Government[3]	37.7	51.1	61.8	66.5	61.4	58.4	57.1	59.2	60.0	61.3	62.1	62.9	63.3
Industry[4,5]	164.1	312.0	348.4	385.6	353.9	363.8	414.2	498.8	516.0	533.3	552.4	570.3	595.2
Universities and colleges, total	25.0	42.4	53.4	68.3	66.5	69.8	76.6	83.3	84.4	85.5	88.6	93.2	96.7
Scientists and engineers	20.3	33.6	40.4	50.4	48.9	51.2	56.0	58.9	59.5	60.6	62.5	65.8	67.8
Graduate students[6]	4.7	8.8	13.0	17.9	17.6	18.6	20.6	24.4	24.9	24.9	26.1	27.4	28.9
University-associated FFRDCs, total	5.0	9.1	11.1	11.6	11.7	12.7	14.1	15.4	15.4	15.3	15.2	16.6	16.6
Scientists and engineers	4.9	8.8	10.7	11.1	11.3	12.3	13.7	15.0	15.0	14.9	14.8	16.2	16.2
Graduate students[6]	.1	.3	.4	.5	.4	.4	.4	.4	.4	.4	.4	.4	.4
Other nonprofit institutions[4]	5.3	11.1	19.9	21.2	21.8	23.0	25.0	27.0	27.0	27.5	28.0	29.5	30.5

[1]Number of full-time employees plus the FTE of part-time employees. Excludes scientists and engineers employed in State and local government agencies. Totals may be understated by about 5 percent because of incomplete data on summer employment at universities and colleges.
[2]Estimate.
[3]Includes both civilian and military service personnel and managers of research and development.
[4]Includes professional R&D personnel employed at FFRDCs administered by organization in the sector.
[5]Excludes social scientists.
[6]Numbers of FTE graduate students receiving stipends and engaged in research and development.
NOTE: The figures for the industry sector represent yearly averages.
SOURCE: National Science Foundation, SRS

Table B-15. National expenditures for performance of R&D as a percent of gross national product (GNP) by source

Year	Total	Federal	Non-Federal
1953	1.38%	0.74%	0.64%
1954	1.52	.84	.67
1955	1.52	.86	.66
1956	1.95	1.13	.82
1957	2.17	1.35	.81
1958	2.34	1.48	.86
1959	2.49	1.62	.87
1960	2.62	1.70	.93
1961	2.68	1.73	.95
1962	2.68	1.72	.95
1963	2.81	1.85	.96
1964	2.90	1.93	.97
1965	2.84	1.85	1.00
1966	2.83	1.81	1.02
1967	2.84	1.76	1.07
1968	2.76	1.67	1.08
1969	2.66	1.55	1.11
1970	2.57	1.47	1.11
1971	2.42	1.36	1.06
1972	2.35	1.30	1.04
1973	2.26	1.21	1.05
1974	2.23	1.14	1.09
1975	2.20	1.13	1.07
1976	2.19	1.12	1.07
1977	2.15	1.08	1.06
1978	2.14	1.06	1.08
1979	2.19	1.07	1.12
1980	2.29	1.08	1.21
1981	2.35	1.09	1.26
1982	2.51	1.15	1.35
1983	2.56	1.19	1.37
1984	2.59	1.20	1.39
1985	2.68	1.28	1.40
1986 (est.)	2.71	1.31	1.40
1987 (est.)	2.74	1.34	1.40

SOURCES: National Science Foundation, SRS, and Department of Commerce

Table B-16. Full-time equivalent R&D scientists and engineers and employed civilian labor force: selected years

[In thousands]

Year	R&D scientists and engineers	Employed civilian labor force
1967	534.4	74,372
1969	553.2	77,902
1971	524.0	79,367
1973	514.8	85,064
1975	527.7	85,846
1977	561.0	92,017
1979	614.8	98,824
1981	683.7	100,397
1983	722.9	100,834
1985	772.5	107,150
1986 (est.)	802.3	109,597

SOURCES: National Science Foundation, SRS, and Department of Labor

Table B-17. National expenditures for performance of R&D as a percent of gross national product (GNP) by country: 1967–86

Year	France	West Germany	Japan	United Kingdom	United States
1967	2.1%	2.0%	1.5%	2.3%	2.8%
1968	2.1	2.0	1.6	2.3	2.8
1969	1.9	1.8	1.6	2.3	2.7
1970	1.9	2.1	1.9	NA	2.6
1971	1.9	2.2	1.9	NA	2.4
1972	1.9	2.2	1.9	2.1	2.3
1973	1.8	2.1	1.9	NA	2.3
1974	1.8	2.1	2.0	NA	2.2
1975	1.8	2.2	2.0	2.2	2.2
1976	1.8	2.2	1.9	NA	2.2
1977	1.8	2.1	1.9	NA	2.1
1978	1.8	2.2	2.0	2.2	2.1
1979	1.8	2.4	2.1	NA	2.2
1980	1.8	2.4	2.2	NA	2.3
1981	2.0	2.4	2.4	2.4	2.4
1982	2.1	2.5	2.5	NA	2.5
1983	2.2	2.5	2.6	2.2	2.6
1984 (prel.)	2.2	2.5	2.6	NA	2.6
1985 (est.)	2.3	2.7	2.8	2.2	2.7
1986 (est.)	2.4	2.7	NA	NA	2.7

NOTE: NA = Not available.
SOURCES: National Science Foundation, SRS, and Organisation for Economic Co-operation and Development

Table B-18. Scientists and engineers[1] engaged in R&D per 10,000 labor force population by country: 1967–85

Year	France	West Germany	Japan	United Kingdom	United States
1967	25.3	24.9	27.8	NA	67.2
1968	26.4	26.2	31.1	20.8	68.0
1969	27.1	28.4	30.8	NA	66.7
1970	27.3	30.8	33.4	NA	64.1
1971	27.9	33.4	37.5	NA	60.7
1972	28.2	35.6	38.1	30.4	58.0
1973	28.5	37.1	42.5	NA	56.4
1974	28.9	37.8	44.9	NA	55.6
1975	29.4	38.6	47.9	31.1	55.3
1976	29.9	39.2	48.4	NA	54.8
1977	30.0	41.8	49.9	NA	55.7
1978	31.0	NA	49.4	33.3	56.5
1979	31.6	45.3	50.4	NA	57.7
1980	32.4	NA	53.6	NA	60.0
1981	36.3	46.5	55.6	35.8	62.0
1982	37.9	47.0	57.1	NA	62.8
1983	39.1	48.4	58.1	35.1	63.8
1984	41.2	49.1	62.4	34.2	65.1
1985	NA	NA	63.2	32.8	67.4

[1]Includes all scientists and engineers engaged in R&D on a full-time-equivalent basis (except Japan whose data include persons primarily employed in R&D and the United Kingdom whose data include only the government and industry sectors).
NOTE: NA = Not available.
SOURCES: National Science Foundation, SRS, U.S. Department of Labor, and Organisation for Economic Co-operation and Development

Table B-19. Estimated ratio of civilian R&D expenditures[1] to gross national product (GNP) for selected countries: 1971–86

Year	France	West Germany	Japan	United Kingdom	United States
1971	1.5%	2.0%	1.8%	NA	1.6%
1972	1.5	2.1	1.8	1.6	1.6
1973	1.4	1.9	1.9	NA	1.6
1974	1.4	2.0	2.0	NA	1.6
1975	1.5	2.1	1.9	1.6	1.6
1976	1.4	2.0	1.9	NA	1.6
1977	1.4	2.0	1.9	NA	1.6
1978	1.4	2.1	2.0	1.6	1.6
1979	1.4	2.3	2.1	NA	1.7
1980	1.4	2.3	2.2	NA	1.8
1981	1.5	2.3	2.4	1.7	1.8
1982	1.6	2.4	2.5	NA	1.9
1983	1.7	2.4	2.6	1.5	1.9
1984 (prel.)	1.8	2.4	2.6	NA	1.8
1985 (est.)	1.8	2.5	2.8	1.5	1.8
1986 (est.)	1.9	2.6	NA	NA	1.8

[1]National R&D expenditures, excluding government funds for defense.
NOTE: NA = Not available.
SOURCES: National Science Foundation, SRS, and Organisation for Economic Co-operation and Development

TABLE B-20. FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT, BY AGENCY: FISCAL YEARS 1978-87

(THOUSANDS OF DOLLARS)

FISCAL YEAR	1978	1979	1980	1981	1982	1983	1984	1985	1986	ESTIMATES 1987
TOTAL, ALL AGENCIES ..	25,845,137	28,145,142	29,830,432	33,103,924	36,432,589	38,711,537	42,224,865	48,359,565	51,412,364	56,491,629
DEPT OF AGRIC, TOTAL .	621,282	663,025	687,586	773,958	797,274	847,605	866,171	942,979	928,528	978,865
FOREST SERVICE	105,617	107,500	111,531	126,055	112,145	107,672	108,359	113,143	113,317	125,763
SCI & ED ADMIN 1/...	482,965	518,393	536,016	-	-	-	-	-	-	-
AGRIC RESEARCH ...	325,541	345,836	351,811	-	-	-	-	-	-	-
AGRIC COOPERATIVE RESEARCH	157,424	172,557	184,205	-	-	-	-	-	-	-
OTHER AGRICULTURE ..	32,700	37,132	8,988	647,903	685,129	739,933	757,812	829,836	815,211	853,102
DEPT OF COMMERCE, TOTAL	283,665	309,359	342,549	327,925	336,278	334,992	358,226	398,759	399,166	407,598
NATIONAL BUREAU OF STANDARDS	58,306	67,800	76,167	82,518	88,837	95,031	95,531	100,534	100,787	100,223
NATIONAL OCEANIC & ATMOS ADMIN	161,450	171,176	199,750	201,351	222,026	222,037	244,300	269,788	274,665	288,464
OTHER COMMERCE	63,909	70,383	66,632	44,056	25,415	17,924	18,395	28,437	23,714	18,911
DEPT OF DEFENSE, TOTAL	11,553,638	12,506,225	13,981,012	16,508,649	20,622,574	22,992,789	25,372,870	29,791,504	32,937,939	36,243,932
ARMY	2,548,927	2,768,674	2,979,987	3,244,159	3,760,489	3,998,085	4,225,532	4,570,793	4,809,370	4,981,899
NAVY	3,998,416	4,335,042	4,706,132	5,005,952	5,845,056	6,068,206	7,605,590	9,127,432	9,650,289	9,503,054
AIR FORCE	4,262,349	4,525,616	5,211,029	6,969,247	9,357,858	10,812,616	12,091,645	13,260,917	13,593,790	15,759,730
DEFENSE AGENCIES ...	707,886	847,583	1,045,984	1,248,240	1,618,134	2,052,300	1,391,540	2,781,724	4,767,388	5,833,332
OTHER DEFENSE	36,060	29,310	37,880	41,051	41,037	61,582	58,563	50,638	117,102	165,917
DEPT OF EDUCATION 2/..	123,772	166,288	139,372	-	127,981	111,681	115,702	124,866	121,308	137,918
DEPT OF ENERGY	4,244,827	4,638,766	4,753,688	4,918,225	4,708,158	4,536,682	4,673,578	4,966,008	4,688,304	4,851,366
DEPT OF HEALTH & HUMAN SERVICES, TOTAL 3/	3,083,482	3,504,880	3,780,221	3,927,141	3,940,745	4,352,530	4,830,693	5,451,036	5,657,604	6,342,509
NAT'L INST OF HEALTH	2,580,862	2,953,133	3,181,830	3,333,249	3,433,148	3,789,222	4,257,436	4,827,737	5,005,100	5,557,200
OTHER HHS	502,620	551,747	598,391	593,892	507,597	563,308	573,257	623,299	652,504	785,309
DEPT OF HOUSING & URBAN DEV	69,723	67,915	56,025	48,108	28,855	32,090	18,236	18,532	15,304	18,700
DEPT OF THE INTERIOR, TOTAL	358,974	405,778	411,258	427,105	381,074	382,473	410,877	391,685	385,219	404,761
BUREAU OF MINES	113,968	121,004	113,373	96,744	94,707	88,533	108,777	89,874	84,350	95,349
GEOLOGICAL SURVEY ..	133,656	145,571	146,339	169,777	152,560	157,004	208,881	214,906	218,620	223,109
OTHER INTERIOR	111,350	139,203	151,546	160,584	133,807	136,936	93,219	86,905	82,249	86,303
DEPT OF JUSTICE	60,919	42,991	41,501	26,527	26,692	31,376	24,520	35,992	36,460	41,893
DEPT OF LABOR	97,835	136,977	138,053	62,188	25,410	19,877	16,259	13,287	10,394	13,069
DEPT OF STATE	2,848	3,168	2,206	1,766	1,549	1,488	1,550	1,482	1,464	7,628
DEPT OF TRANS, TOTAL .	408,250	370,089	361,230	415,539	310,083	347,728	448,335	428,859	385,474	310,098
FED AVIATION ADMIN .	110,500	110,500	103,100	120,000	94,300	126,200	266,182	286,300	260,600	171,000
OTHER TRANSPORTATION	297,750	259,589	258,130	295,539	215,783	221,528	182,153	142,559	124,874	139,098
DEPT OF THE TREASURY .	9,878	9,541	12,033	11,306	13,323	15,583	13,853	24,305	24,011	25,478
OTHER AGENCIES										
ENVIRON'L PROTECTION AGENCY	384,636	410,100	345,000	325,700	335,089	240,709	261,172	320,413	317,319	329,152
NAT'L AERONAUTICS & SPACE ADMIN	3,333,260	3,578,404	3,234,088	3,593,155	3,077,859	2,661,579	2,821,900	3,327,200	3,419,800	4,184,600
NAT'L SCI FOUNDATION .	748,775	807,925	881,792	961,564	975,327	1,061,990	1,202,820	1,345,583	1,353,335	1,462,700
NUCLEAR REGULATORY COMMISSION	133,891	148,772	182,672	219,667	220,287	207,295	190,675	149,959	123,785	111,685
VETERANS ADMIN	113,991	127,004	133,400	144,400	137,300	161,400	190,300	226,600	186,200	209,700
ALL OTHER	211,491	247,935	346,746	306,139	366,731	371,670	407,128	400,008	419,782	408,864

1/ THE SCIENCE AND EDUCATION ADMINISTRATION WAS ESTABLISHED IN FY 1977.

2/ DEPARTMENT OF EDUCATION DATA SHOWN FOR FISCAL YEAR 1978 ARE COMPOSED OF DATA FOR THE OFFICE OF EDUCATION, THE NATIONAL INSTITUTE OF EDUCATION, AND THE ASSISTANT SECRETARY FOR EDUCATION OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (HEW).

3/ THE DEPARTMENT OF HEALTH AND HUMAN SERVICES WAS ESTABLISHED IN FY 1979; DATA SHOWN FOR PRIOR YEARS ARE HEW AMOUNTS MINUS EDUCATION PROGRAMS.

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

Table B-21. Federal R&D funding by budget function: fiscal years 1978–87

[Dollars in millions]

Function	Actual									Estimate
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Total	$25,976	$28,208	$29,739	$33,735	$36,115	$38,768	$44,214	$49,887	$53,192	$58,148
National defense	12,899	13,791	14,946	18,413	22,070	24,936	29,287	33,698	36,926	40,260
Health	2,968	3,401	3,694	3,871	3,869	4,298	4,779	5,418	5,565	6,608
Space research and technology	2,939	3,136	2,738	3,111	2,584	2,134	2,300	2,725	2,894	3,344
General science	1,050	1,119	1,233	1,340	1,359	1,502	1,676	1,862	1,873	2,041
Energy	3,134	3,461	3,603	3,501	3,012	2,578	2,581	2,389	2,286	2,155
Natural resources and environment	904	1,010	999	1,061	965	952	963	1,059	1,062	1,083
Transportation	768	798	887	869	791	876	1,040	1,030	917	889
Agriculture	501	552	585	659	693	745	762	836	815	865
International affairs	57	117	125	160	165	177	192	210	211	217
Education, training, employment and social services	345	354	468	298	228	189	200	220	248	253
Veterans benefits and services	111	123	126	143	139	157	218	193	183	215
Commerce and housing credit	77	93	101	106	104	107	110	114	111	112
Administration of justice	44	47	45	34	31	37	24	47	41	42
Community and regional development	92	127	119	104	63	44	46	50	32	29
Income security	67	57	47	43	32	32	26	21	14	22
General government	20	23	22	22	10	6	8	17	14	15

NOTE: Data for 1978–86 are shown in actual budget authority. Data for 1987 are estimates based on the FY 1988 budget.
SOURCE: National Science Foundation, SRS

TABLE B-22. FEDERAL OBLIGATIONS FOR BASIC RESEARCH BY AGENCY: FISCAL YEARS 1978-87

(THOUSANDS OF DOLLARS)

AGENCY AND SUBDIVISION	1978	1979	1980	1981	1982	1983	1984	1985	1986	ESTIMATES 1987
TOTAL, ALL AGENCIES ..	3,698,604	4,192,665	4,674,156	5,041,295	5,481,605	6,260,131	7,067,359	7,818,682	8,153,076	8,821,058
DEPT OF AGRICULTURE ..	242,704	256,420	275,650	314,128	330,755	362,019	392,649	445,388	432,857	454,635
DEPT OF COMMERCE	11,806	11,900	15,910	16,204	16,867	19,221	20,613	23,227	26,523	23,814
DEPT OF DEFENSE, TOTAL	410,410	471,527	540,341	604,285	686,684	785,620	847,857	861,407	923,915	861,220
ARMY	104,073	115,040	132,190	148,089	187,662	208,320	222,090	240,753	248,450	208,038
NAVY	172,088	192,122	214,900	238,000	280,300	305,400	315,765	343,110	337,267	341,992
AIR FORCE	95,100	105,025	108,200	125,800	145,800	164,200	192,359	198,298	216,483	205,097
DEFENSE AGENCIES ...	39,149	59,340	85,051	92,396	72,922	107,700	117,643	79,246	121,715	106,093
OTHER DEFENSE	-	-	-	-	-	-	-	-	-	-
DEPT OF EDUCATION 1/..	18,276	20,567	17,583	20,576	14,199	14,182	12,221	14,642	4,522	5,323
DEPT OF ENERGY	440,534	462,968	523,136	586,340	642,211	767,718	830,432	942,592	959,668	1,078,287
DEPT OF HEALTH & HUMAN SERVICES, TOTAL 2/	1,274,063	1,576,011	1,762,668	1,900,384	2,144,694	2,475,400	2,814,525	3,232,547	3,338,767	3,661,036
NAT'L INST OF HEALTH	1,181,094	1,463,703	1,642,341	1,766,788	2,020,650	2,313,026	2,624,774	3,018,004	3,118,600	3,384,335
OTHER HHS	92,969	112,308	120,327	133,596	124,044	162,374	189,751	214,543	220,167	276,701
DEPT OF THE INTERIOR .	65,876	72,522	71,634	80,663	76,454	103,033	125,921	138,274	132,986	140,874
DEPT OF TRANSPORTATION	-	-	-	1,210	1,000	900	3,481	1,063	608	191
OTHER AGENCIES										
ENVIRON'L PROTECTION AGENCY	6,010	10,100	13,600	10,500	32,687	22,217	29,625	38,634	38,489	38,439
NATIONAL AERONAUTICS & SPACE ADMIN	479,729	512,847	559,113	531,122	535,733	617,033	754,500	750,900	916,700	1,068,800
NAT'L SCI FOUNDATION .	678,040	733,255	815,246	896,569	916,078	999,136	1,132,340	1,261,807	1,275,221	1,378,329
NUCLEAR REGULATORY COMMISSION	-	-	-	-	-	-	-	-	-	-
SMITHSONIAN INST	34,896	36,901	41,006	44,861	52,357	55,960	63,613	71,063	63,273	72,773
VETERANS ADMIN	8,891	9,523	14,300	15,000	12,900	14,100	15,800	15,400	14,800	15,500
ALL OTHER	27,369	18,124	23,969	19,453	18,986	23,592	23,782	21,738	24,747	21,837

1/ DEPARTMENT OF EDUCATION DATA SHOWN FOR 1978 ARE COMPOSED OF DATA FOR THE OFFICE OF EDUCATION, THE NATIONAL INSTITUTE OF EDUCATION, AND THE ASSISTANT SECRETARY FOR EDUCATION OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (HEW).

2/ THE DEPARTMENT OF HEALTH AND HUMAN SERVICES WAS ESTABLISHED IN FY 1979; DATA SHOWN FOR PRIOR YEARS ARE HEW AMOUNTS MINUS EDUCATION PROGRAMS.

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

TABLE B-23. FEDERAL OBLIGATIONS FOR APPLIED RESEARCH BY AGENCY: FISCAL YEARS 1978-87

(THOUSANDS OF DOLLARS)

AGENCY AND SUBDIVISION	1978	1979	1980	1981	1982	1983	1984	1985	1986	ESTIMATES 1987
TOTAL, ALL AGENCIES ..	5,908,154	6,342,340	6,923,222	7,171,485	7,540,580	7,993,394	7,911,414	8,314,739	8,349,123	8,990,931
DEPT OF AGRICULTURE ..	351,780	375,500	381,785	426,856	435,708	455,539	442,238	465,552	463,549	490,681
DEPT OF COMMERCE	180,969	207,558	238,523	233,171	259,188	265,620	276,088	300,952	312,936	329,086
DEPT OF DEFENSE, TOTAL	1,413,648	1,542,571	1,721,428	1,996,615	2,266,137	2,437,029	2,200,674	2,306,876	2,303,348	2,333,861
ARMY	305,737	333,570	347,065	388,366	451,561	485,291	486,692	582,631	578,838	613,629
NAVY	354,229	375,193	396,200	460,000	498,400	521,600	449,598	448,222	447,075	419,602
AIR FORCE	353,645	387,228	429,100	491,500	488,100	524,200	547,739	538,355	542,474	504,489
DEFENSE AGENCIES ...	392,537	446,580	549,063	656,749	828,076	905,938	716,645	737,668	734,961	796,141
OTHER DEFENSE	7,500	-	-	-	-	-	-	-	-	-
DEPT OF EDUCATION 1/..	30,967	72,825	69,992	33,212	56,268	61,885	68,680	77,263	91,317	102,548
DEPT OF ENERGY	661,709	668,878	754,190	827,265	1,053,877	1,193,409	1,194,457	1,198,445	1,080,653	1,072,438
DEPT OF HEALTH & HUMAN SERVICES, TOTAL 2/	1,417,411	1,439,658	1,570,109	1,591,857	1,460,890	1,545,446	1,651,498	1,795,787	1,850,791	2,160,249
NAT'L INST OF HEALTH	1,051,502	1,066,408	1,145,129	1,181,521	1,103,802	1,165,179	1,285,643	1,410,113	1,469,000	1,694,946
OTHER HHS	365,909	373,250	424,980	410,336	357,088	380,267	365,855	385,674	381,791	465,303
DEPT OF THE INTERIOR .	217,616	266,946	282,812	289,174	275,006	254,675	254,303	230,978	234,926	244,037
DEPT OF TRANSPORTATION	66,500	66,983	82,445	87,379	65,685	71,696	74,211	70,163	67,615	75,488
OTHER AGENCIES										
ENVIRON'L PROTECTION AGENCY	246,660	248,900	231,500	207,800	210,692	152,380	142,336	175,994	179,292	171,202
NATIONAL AERONAUTICS & SPACE ADMIN	865,438	938,389	1,050,531	876,036	871,407	927,787	954,700	1,032,700	1,152,300	1,410,600
NAT'L SCI FOUNDATION .	65,462	66,770	58,441	58,895	57,087	62,854	70,480	83,776	78,114	84,371
NUCLEAR REGULATORY COMMISSION	133,891	148,772	182,672	219,667	220,287	207,295	190,675	149,959	123,785	111,685
SMITHSONIAN INST	-	-	-	-	-	-	-	-	-	-
VETERANS ADMIN	90,509	101,839	103,600	112,700	110,100	132,000	156,100	193,700	155,100	173,800
ALL OTHER	165,594	196,751	195,194	210,858	198,248	225,779	234,974	232,594	255,397	230,885

1/ DEPARTMENT OF EDUCATION DATA SHOWN FOR 1978 ARE COMPOSED OF DATA FOR THE OFFICE OF EDUCATION, THE NATIONAL INSTITUTE OF EDUCATION, AND THE ASSISTANT SECRETARY FOR EDUCATION OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (HEW).

2/ THE DEPARTMENT OF HEALTH AND HUMAN SERVICES WAS ESTABLISHED IN FY 1979; DATA SHOWN FOR PRIOR YEARS ARE HEW AMOUNTS MINUS EDUCATION PROGRAMS.

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

TABLE B-24. FEDERAL OBLIGATIONS FOR DEVELOPMENT BY AGENCY: FISCAL YEARS 1978-87

(THOUSANDS OF DOLLARS)

AGENCY AND SUBDIVISION	1978	1979	1980	1981	1982	1983	1984	1985	1986	ESTIMATES 1987
TOTAL, ALL AGENCIES ..	16,238,379	17,610,137	18,233,054	20,891,144	23,410,404	24,458,012	27,246,092	32,226,144	34,910,165	38,679,640
DEPT OF AGRICULTURE ..	26,798	31,105	30,151	32,974	30,811	30,047	31,284	32,039	32,122	33,549
DEPT OF COMMERCE	90,890	89,901	88,116	78,550	60,223	50,151	61,525	74,580	59,707	54,698
DEPT OF DEFENSE, TOTAL	9,729,580	10,492,127	11,719,243	13,907,749	17,669,753	19,770,140	22,324,339	26,623,221	29,710,676	33,048,851
ARMY	2,139,117	2,320,064	2,500,732	2,707,704	3,121,266	3,304,474	3,516,750	3,747,409	3,982,082	4,160,232
NAVY	3,472,099	3,767,727	4,095,032	4,307,952	5,066,356	5,241,206	6,840,227	8,336,100	8,865,947	8,741,460
AIR FORCE	3,813,604	4,033,363	4,673,729	6,351,947	8,723,958	10,124,216	11,351,547	12,524,264	12,834,833	15,050,144
DEFENSE AGENCIES ...	276,200	341,663	411,870	499,095	717,136	1,038,662	557,252	1,964,810	3,910,712	4,931,098
OTHER DEFENSE	28,560	29,310	37,880	41,051	41,037	61,582	58,563	50,638	117,102	165,917
DEPT OF EDUCATION 1/..	74,529	72,896	51,797	51,074	57,514	35,614	34,801	32,961	25,469	30,047
DEPT OF ENERGY	3,142,584	3,506,920	3,476,362	3,504,620	3,012,070	2,575,555	2,648,689	2,824,971	2,647,983	2,700,641
DEPT OF HEALTH & HUMAN SERVICES, TOTAL 2/	392,008	489,211	447,444	434,900	335,161	331,684	364,670	422,702	468,046	521,224
NAT'L INST OF HEALTH	348,266	423,022	394,360	384,940	308,696	311,017	347,019	399,620	417,500	477,919
OTHER HHS	43,742	66,189	53,084	49,960	26,465	20,667	17,651	23,082	50,546	43,305
DEPT OF THE INTERIOR .	75,482	66,310	56,812	57,268	29,614	24,765	30,653	22,433	17,307	19,850
DEPT OF TRANSPORTATION	341,750	303,106	278,785	326,950	243,398	275,132	370,643	357,633	317,251	234,419
OTHER AGENCIES										
ENVIRON'L PROTECTION AGENCY	131,966	151,100	99,900	107,400	91,710	66,112	89,211	105,785	99,538	119,511
NATIONAL AERONAUTICS & SPACE ADMIN	1,988,093	2,127,168	1,624,444	2,185,997	1,670,719	1,116,759	1,112,700	1,543,600	1,350,800	1,705,200
NAT'L SCI FOUNDATION .	5,273	7,900	8,105	6,100	2,162	-	-	-	-	-
NUCLEAR REGULATORY COMMISSION	-	-	-	-	-	-	-	-	-	-
SMITHSONIAN INST	-	-	-	-	-	-	-	-	-	-
VETERANS ADMIN	14,591	15,642	15,500	16,700	14,300	15,300	18,400	17,500	16,300	20,400
ALL OTHER	224,835	256,751	336,395	180,862	192,969	166,753	159,177	168,719	164,966	191,250

1/ DEPARTMENT OF EDUCATION DATA SHOWN FOR 1978 ARE COMPOSED OF DATA FOR THE OFFICE OF EDUCATION, THE NATIONAL INSTITUTE OF EDUCATION, AND THE ASSISTANT SECRETARY FOR EDUCATION OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (HEW).

2/ THE DEPARTMENT OF HEALTH AND HUMAN SERVICES WAS ESTABLISHED IN FY 1979; DATA SHOWN FOR PRIOR YEARS ARE HEW AMOUNTS MINUS EDUCATION PROGRAMS.

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

Table B-25. Funds for industrial R&D performance by industry: 1974–85
[Dollars in millions]

Industry and size of company	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Total		$22,887	$24,187	$26,997	$29,825	$33,304	$38,226	$44,505	$51,810	$57,996	$63,403	$71,470	$78,208
Distribution by industry													
Food and kindred products	20	298	335	355	415	472	528	620	(1)	(1)	(1)	(1)	(1)
Textiles and apparel	22,23	69	70	82	83	89	101	115	(1)	(1)	(1)	(1)	(1)
Lumber, wood products, and furniture	24,25	84	88	107	123	126	139	148	161	162	169	181	172
Paper and allied products	26	237	249	313	333	387	445	495	(1)	626	(1)	(1)	(1)
Chemicals and allied products	28	2,450	2,727	3,017	3,202	3,580	4,038	4,636	5,625	6,659	7,293	8,028	8,667
Industrial chemicals	281-82,286	1,299	1,391	1,524	1,668	1,798	1,962	2,197	2,802	3,301	3,411	3,512	3,915
Drugs and medicines	283	807	981	1,091	1,117	1,308	1,517	1,777	(1)	(1)	(1)	(1)	3,548
Other chemicals	284-85,287-89	344	354	401	417	474	559	662	(1)	(1)	(1)	(1)	1,204
Petroleum refining and related industries	29	622	693	767	918	1,060	1,262	1,552	(1)	(1)	(1)	(1)	(1)
Rubber products	30	469	467	502	491	493	577	656	(1)	(1)	(1)	(1)	1,147
Stone, clay, and glass products	32	217	233	263	287	324	356	406	(1)	(1)	(1)	(1)	(1)
Primary metals	33	358	443	506	538	560	634	728	878	1,000	1,115	(1)	(1)
Ferrous metals and products	331-32,3398-99	181	215	256	284	314	375	443	(1)	(1)	(1)	(1)	(1)
Nonferrous metals and products	333-36	177	228	250	254	246	259	285	(1)	(1)	(1)	357	428
Fabricated metal products	34	313	324	358	386	384	455	550	624	568	604	716	624
Machinery	35	2,985	3,196	3,487	3,880	4,283	4,825	5,901	6,818	7,835	8,386	9,667	10,870
Office, computing, and accounting machines	357	2,103	2,220	2,402	2,655	2,883	3,214	3,962	(1)	(1)	(1)	(1)	(1)
Other machinery, except electrical	351-56,358-59	(2)	(2)	(2)	1,225	1,400	1,611	1,939	(1)	(1)	(1)	(1)	(1)
Electrical equipment	36	5,011	5,105	5,636	5,886	6,507	7,824	9,175	10,329	11,642	13,950	15,694	17,080
Radio and TV receiving equipment	365	51	50	52	96	130	245	556	(1)	(1)	(1)	(1)	(1)
Communication equipment	366	2,424	2,385	2,511	2,725	2,999	3,635	4,024	4,758	5,750	7,112	8,319	9,019
Electronic components	367	489	549	691	770	902	1,169	1,547	1,573	1,661	1,964	2,441	2,779
Other electrical equipment	361-64,369	2,047	2,121	2,382	2,295	2,476	2,775	3,048	(1)	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	2,389	2,340	2,778	3,358	3,879	4,509	4,955	4,806	4,807	5,337	6,090	7,058
Other transportation equipment	373-75,379	87	90	94	120	131	159	162	(1)	(1)	(1)	(1)	(1)
Aircraft and missiles	372,376	5,278	5,713	6,339	7,033	7,536	8,041	9,198	11,968	13,658	13,853	16,033	17,619
Professional and scientific instruments	38	1,075	1,173	1,331	1,571	1,998	2,505	3,029	3,614	4,019	4,444	4,840	5,430
Scientific and mechanical measuring instruments	381-82	221	266	325	452	670	950	1,352	(1)	(1)	(1)	(1)	(1)
Optical, surgical, photographic and other instruments	383-87	854	907	1,007	1,119	1,328	1,555	1,677	(1)	(1)	(1)	(1)	(1)
Other manufacturing industries	21,27,31,39	177	205	217	243	266	288	364	(1)	(1)	(1)	(1)	(1)
Nonmanufacturing industries	07-17,41-67,737 739,807,891	768	735	845	958	1,229	1,540	1,815	1,906	2,005	2,189	2,585	2,851

[1]Not separately available but included in total.
[2]Data not tabulated at this level prior to 1977.
SOURCE: National Science Foundation, SRS

Table B-26. Federal funds for industrial R&D performance by industry: 1974–85
[Dollars in millions]

Industry and size of company	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Total		$8,220	$8,605	$9,561	$10,485	$11,189	$12,518	$14,029	$16,382	$18,483	$20,542	$23,162	$26,484
Distribution by industry													
Food and kindred products	20	1	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Textiles and apparel	22,23	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Lumber, wood products, and furniture	24,25	(1)	0	0	0	0	0	(1)	0	0	0	0	0
Paper and allied products	26	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	0	(1)	(1)	(1)
Chemicals and allied products	28	214	236	266	295	330	346	372	421	434	448	232	316
Industrial chemicals	281-82,286	194	218	249	281	325	345	341	409	423	440	223	298
Drugs and medicines	283	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	3
Other chemicals	284-85,287-89	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	15
Petroleum refining and related industries	29	20	(1)	52	76	121	153	151	(1)	(1)	(1)	(1)	(1)
Rubber products	30	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	313
Stone, clay, and glass products	32	14	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Primary metals	33	8	21	26	44	63	95	135	176	279	392	(1)	(1)
Ferrous metals and products	331-32,3398-99	(1)	3	4	23	43	70	105	(1)	(1)	(1)	(1)	(1)
Nonferrous metals and products	333-36	(1)	17	22	21	20	25	30	(1)	(1)	(1)	32	41
Fabricated metal products	34	14	27	36	44	36	41	49	80	58	62	61	42
Machinery	35	511	509	532	477	382	335	647	694	857	1,131	1,216	1,536
Office, computing, and accounting machines	357	(2)	486	509	435	327	256	(1)	(1)	(1)	(1)	(1)	(1)
Other machinery, except electrical	351-56,358-59	(2)	(2)	(2)	42	55	79	(1)	(1)	(1)	(1)	(1)	(1)
Electrical equipment	36	2,307	2,307	2,555	2,648	2,766	3,309	3,744	3,920	4,593	5,286	5,956	6,887
Radio and TV receiving equipment	365	(1)	(1)	0	11	28	53	210	(1)	(1)	(1)	(1)	(1)
Communication equipment	366	1,137	1,057	1,093	1,166	1,236	1,586	1,657	1,783	2,182	2,572	3,114	3,606
Electronic components	367	184	(1)	(1)	(1)	(1)	(1)	382	361	391	346	452	520
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)	1,495	(1)	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	288	318	383	471	498	729	655	587	477	566	677	978
Other transportation equipment	373-75,379	47	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Aircraft and missiles	372,376	4,000	4,428	4,921	5,486	5,713	5,840	6,628	8,528	9,776	10,405	12,228	13,421
Professional and scientific instruments	38	167	172	163	221	330	493	573	637	623	639	660	707
Scientific and mechanical measuring instruments	381-82	10	15	15	47	110	203	350	(1)	(1)	(1)	(1)	(1)
Optical, surgical, photographic and other instruments	383-87	157	157	148	174	220	290	223	(1)	(1)	(1)	(1)	(1)
Other manufacturing industries	21,27,31,39	(1)	7	5	39	0	0	25	(1)	(1)	(1)	(1)	(1)
Nonmnaufacturing industries	07-17,41-67,737 739,807,891	463	310	375	417	527	681	779	858	904	1,022	1,215	1,485

[1]Not separately available but included in total.
[2]Data not tabulated at this level prior to 1977.
SOURCE: National Science Foundation, SRS

Table B-27. Company funds for industrial R&D performance by industry: 1974–85
[Dollars in millions]

Industry and size of company	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Total		$14,667	$15,582	$17,436	$19,340	$22,115	$25,708	$30,476	$35,428	$39,512	$42,861	$48,308	$51,724
Distribution by industry													
Food and kindred products	20	297	(1)	(1)	(1)	(1)	(1)	(1)	636	762	766	1,001[3]	1,042[3]
Textiles and apparel	22,23	(1)	(1)	(1)	(1)	(1)	(1)	(1)	116	124	125	139	150
Lumber, wood products, and furniture	24,25	(1)	88	106	123	126	139	148	161	162	169	181	172
Paper and allied products	26	(1)	(1)	(1)	(1)	(1)	(1)	495	566	626	674	802	859
Chemicals and allied products	28	2,236	2,490	2,751	2,907	3,250	3,692	4,264	5,205	6,226	6,845	7,797	8,352
Industrial chemicals	281-82,286	1,105	1,173	1,275	1,387	1,473	1,617	1,856	2,393	2,879	2,970	3,289	3,618
Drugs and medicines	283	(1)	(1)	(1)	(1)	(1)	(1)	1,756	2,064	2,490	2,937	3,381	3,545
Other chemicals	284-85,287-89	(1)	(1)	(1)	(1)	(1)	(1)	653	747	856	938	1,126	1,189
Petroleum refining and related industries	29	603	(1)	715	842	939	1,109	1,401	1,780	1,981	2,030	2,177	2,106
Rubber products	30	(1)	(1)	(1)	(1)	(1)	(1)	(1)	598	665	743	884	834
Stone, clay, and glass products	32	203	(1)	(1)	(1)	(1)	(1)	363	411	414	451	476	486
Primary metals	33	350	422	481	494	497	539	594	702	721	722	715	758
Ferrous metals and products	331-32,3398-99	(1)	211	252	261	271	305	338	415	436	419	389	371
Nonferrous metals and products	333-36	(1)	211	229	233	227	234	256	287	285	303	326	387
Fabricated metal products	34	299	297	322	342	348	414	501	545	510	542	654	582
Machinery	35	2,473	2,687	2,955	3,403	3,901	4,490	5,254	6,124	6,977	7,254	8,452	9,334
Office, computing, and accounting machines	357	(1)	1,734	1,893	2,220	2,556	2,958	3,436	3,847	4,722	5,182	6,171	7,122
Other machinery, except electrical	251-56,358-59	(2)	(2)	(2)	1,183	1,345	1,532	1,818	2,277	2,255	2,072	2,281	2,212
Electrical equipment	36	2,704	2,798	3,081	3,238	3,741	4,515	5,431	6,409	7,048	8,664	9,738	10,194
Radio and TV receiving equipment	365	(1)	(1)	52	85	102	192	346	358	398	388	474	501
Communication equipment	366	1,287	1,328	1,418	1,559	1,763	2,049	2,367	2,975	3,568	4,540	5,205	5,413
Electronic components	367	306	(1)	(1)	(1)	(1)	(1)	1,165	1,212	1,269	1,618	1,989	2,259
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)	1,553	1,864	1,813	2,118	2,070	2,020
Motor vehicles and motor vehicles equipment	371	2,101	2,022	2,395	2,887	3,381	3,780	4,300	4,219	4,329	4,771	5,413	6,080
Other transportation equipment	373-75,379	40	43	(1)	(1)	(1)	(1)	88	80	96	160	152	138
Aircraft and missiles	372,376	1,278	1,285	1,418	1,547	1,823	2,201	2,570	3,440	3,882	3,448	3,804	4,198
Professional and scientific instruments	38	908	1,001	1,168	1,350	1,668	2,012	2,456	2,978	3,396	3,805	4,180	4,724
Scientific and mechanical measuring instruments	381-82	211	251	309	405	560	747	1,001	1,235	1,433	1,773	1,941	2,159
Optical, surgical, photographic and other instruments	383-87	697	750	859	945	1,108	1,265	1,454	1,743	1,963	2,032	2,239	2,564
Other manufacturing industries	21,27,31,39	(1)	198	212	204	266	288	339	411	493	525	373	350
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	305	425	471	541	702	859	1,037	1,048	1,101	1,167	1,370	1,366

[1]Not separately available but included in total.
[2]Data not tabulated at this level prior to 1977.
[3]Includes "tobacco products," SIC 21.
SOURCE: National Science Foundation, SRS

Table B-28. R&D funds as a percent of net sales in R&D-performing manufacturing companies by industry: 1974–85

Industry and size of company	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Total		3.1%	3.1%	3.1%	2.9%	2.9%	2.6%	3.0%	3.1%	3.8%	3.9%	3.8%	4.2%
Distribution by industry													
Food and kindred products	20	.4	.4	.4	.4	.4	.4	.4	(1)	(1)	(1)	(1)	(1)
Textiles and apparel	22,23	.4	.4	.4	.4	.4	.4	.4	(1)	(1)	(1)	(1)	(1)
Lumber, wood products, and furniture	24,25	.8	.7	.7	.8	.7	.7	.8	.8	.9	.8	.7	.6
Paper and allied products	26	.8	.9	1.0	.9	.9	1.0	1.0	(1)	1.2	(1)	(1)	(1)
Chemicals and allied products	28	3.5	3.7	3.7	3.6	3.6	3.5	3.6	3.6	4.3	4.4	4.6	4.8
Industrial chemicals	281-82,286	3.3	3.6	3.7	3.5	3.5	3.2	3.3	3.2	4.0	3.9	3.9	4.3
Drugs and medicines	283	6.3	6.4	6.3	6.4	6.2	6.1	6.2	(1)	(1)	(1)	(1)	8.4
Other chemicals	284-85,287-89	1.6	1.7	1.7	1.8	1.8	1.8	1.9	(1)	(1)	(1)	(1)	2.6
Petroleum refining and related products	29	.6	.7	.6	.7	.7	.7	.6	(1)	(1)	(1)	(1)	(1)
Rubber products	30	2.5	2.5	2.4	2.1	1.9	1.9	2.2	(1)	(1)	(1)	(1)	3.0
Stone, clay, and glass products	32	1.7	1.2	1.2	1.3	1.3	1.3	1.4	(1)	(1)	(1)	(1)	(1)
Primary metals	33	.6	.8	.8	.7	.7	.6	.7	.9	1.1	1.3	(1)	(1)
Ferrous metals and products	331-32,3398-99	.5	.6	.6	.6	.6	.6	.7	(1)	(1)	(1)	(1)	(1)
Nonferrous metals and products	333-36	1.0	1.2	1.2	1.0	.8	.7	.7	(1)	(1)	(1)	1.2	1.6
Fabricated metal products	34	1.2	1.2	1.2	1.2	1.1	1.1	1.4	1.4	1.3	1.5	1.5	1.4
Machinery	35	4.6	4.8	4.9	4.9	4.6	4.5	5.0	4.9	5.5	5.9	6.0	6.8
Office, computing, and accounting machines	357	12.6	12.0	11.6	11.5	11.1	11.0	12.0	(1)	(1)	(1)	(1)	(1)
Other machinery, except electrical	351-56,358-59	(2)	(2)	(2)	2.2	2.1	2.1	2.3	(1)	(1)	(1)	(1)	(1)
Electrical equipment	36	6.6	6.5	6.7	6.9	5.8	6.0	6.6	6.8	7.7	8.6	7.5	8.0
Radio and TV receiving equipment	365	1.7	1.4	1.4	1.8	1.8	2.5	4.3	(1)	(1)	(1)	(1)	(1)
Communication equipment	366	7.6	7.6	7.6	7.7	7.7	8.8	9.1	9.6	11.5	12.5	9.3	9.6
Electronic components	367	6.2	6.9	7.3	6.8	6.7	7.1	7.9	7.4	6.7	7.6	7.5	9.1
Other electrical equipment	361-64,369	6.3	6.0	6.3	5.2	5.1	4.9	4.9	(1)	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	3.7	3.5	3.2	3.1	3.3	3.8	4.9	4.5	4.6	4.1	3.5	3.7
Other transportation equipment	373-75,379	1.3	1.3	1.3	1.2	.8	.8	.6	(1)	(1)	(1)	(1)	(1)
Aircraft and missiles	372,376	14.1	12.7	12.7	13.3	13.3	12.9	13.7	16.0	17.7	16.2	16.9	17.5
Professional and scientific instruments	38	6.1	5.9	6.2	6.3	6.9	7.3	7.5	8.1	8.9	9.4	9.2	10.3
Scientific and mechanical measuring instruments	381-82	4.5	4.9	5.4	6.3	7.1	7.3	8.4	(1)	(1)	(1)	(1)	(1)
Optical, surgical, photographic and other instruments	383-87	6.7	6.3	6.4	6.4	6.8	7.2	6.9	(1)	(1)	(1)	(1)	(1)
Other manufacturing industries	21,27,31,39	.9	.8	.7	.6	.5	.4	.4	(1)	(1)	(1)	(1)	(1)

[1]Not separately available but included in total.
[2]Data not tabulated at this level prior to 1977.
SOURCE: National Science Foundation, SRS

Table B-29. Company R&D funds as a percent of net sales in R&D performing manufacturing companies by industry: 1974–85

Industry and size of company	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Total		2.0%	2.0%	2.0%	2.0%	2.0%	1.9%	2.1%	2.2%	2.6%	2.6%	2.6%	2.8%
Distribution by industry													
Food and kindred products	20	.4	(1)	(1)	(1)	(1)	(1)	(1)	.4	.4	.4	.4	.4
Textiles and apparel	22,23	(1)	(1)	(1)	(1)	(1)	(1)	(1)	.4	.5	.4	.4	.5
Lumber, wood products, and furniture	24,25	(1)	.7	.7	.8	.7	.7	.8	.8	.9	.8	.7	.6
Paper and allied products	26	(1)	(1)	(1)	(1)	(1)	(1)	1.0	1.0	1.2	1.1	1.2	1.3
Chemicals and allied products	28	3.0	3.1	3.3	3.3	3.2	3.2	3.3	3.4	4.0	4.1	4.5	4.7
Industrial chemicals	281-82,286	2.8	3.1	3.1	3.0	2.9	2.6	2.8	2.8	3.5	3.4	3.7	4.0
Drugs and medicines	283	(1)	(1)	(1)	(1)	(1)	(1)	6.1	6.3	7.1	7.8	8.4	8.4
Other chemicals	284-85,287-89	(1)	(1)	(1)	(1)	(1)	(1)	1.9	2.1	2.2	2.3	2.5	2.5
Petroleum refining and related products	29	.5	(1)	.6	.6	.7	.6	.5	.6	.8	.7	.7	.7
Rubber products	30	(1)	(1)	(1)	(1)	(1)	(1)	(1)	1.9	2.2	2.2	2.2	2.2
Stone, clay, and glass products	32	1.5	(1)	(1)	(1)	(1)	(1)	1.3	1.4	1.5	1.5	1.3	1.3
Primary metals	33	.5	.7	.8	.7	.6	.5	.5	.7	.8	.8	.7	.7
Ferrous metals and products	331-32,3398-99	(1)	.6	.6	.6	.5	.5	.5	.6	.7	.7	.6	.5
Nonferrous metals and products	333-36	(1)	1.1	1.1	.9	.8	.6	.6	1.0	1.2	1.1	1.1	1.4
Fabricated metal products	34	1.1	1.1	1.1	1.1	1.0	1.0	1.2	1.2	1.2	1.3	1.4	1.3
Machinery	35	3.8	4.0	4.2	4.3	4.2	4.2	4.5	4.4	4.9	5.1	5.2	5.8
Office, computing, and accounting machines	357	(1)	9.4	9.1	9.6	9.8	10.1	10.4	9.7	10.3	10.0	10.4	11.8
Other machinery, except electrical	351-56,358-59	(2)	(2)	(2)	2.1	2.0	2.0	2.2	2.3	2.3	2.3	2.2	2.2
Electrical equipment	36	3.5	3.6	3.7	3.4	3.4	3.6	3.9	4.2	4.7	5.3	4.6	4.8
Radio and TV receiving equipment	365	(1)	1.4	1.4	1.6	1.4	1.7	2.7	2.6	2.9	2.3	2.6	2.7
Communication equipment	366	3.9	4.2	4.3	4.4	4.5	5.0	5.4	6.0	7.1	8.0	5.8	5.7
Electronic components	367	3.9	(1)	(1)	(1)	(1)	(1)	5.9	5.7	5.1	6.3	6.1	7.4
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)	2.5	2.8	2.9	3.3	3.0	2.8
Motor vehicles and motor vehicles equipment	371	3.2	3.0	2.7	2.7	2.9	3.2	4.2	3.9	4.1	3.6	3.1	3.2
Other transportation equipment	373-75,379	.6	.6	.6	.7	(1)	(1)	.3	.3	.6	1.3	1.3	1.2
Aircraft and missiles	372,376	3.5	2.8	2.8	2.9	3.2	3.5	3.8	4.6	5.0	4.0	4.0	4.1
Professional and scientific instruments	38	5.2	5.1	5.4	5.4	5.7	5.8	6.1	6.7	7.5	8.0	7.9	9.0
Scientific and mechanical measuring instruments	381-82	4.4	4.7	5.3	5.7	5.9	5.8	6.2	6.9	7.7	9.0	8.5	9.4
Optical, surgical, photographic and other instruments	383-87	5.5	5.2	5.5	5.4	5.6	5.9	6.0	6.6	7.3	7.3	7.5	8.6
Other manufacturing industries	21,27,31,39	(1)	.7	.7	.6	.5	.4	.4	.4	.8	.9	.9	.8

[1]Not separately available but included in total.
[2]Data not tabulated at this level prior to 1977.
SOURCE: National Science Foundation, SRS

Table B-30. Funds for the performance of industrial basic research by industry: selected years
[Dollars in millions]

Industry and size of company	SIC code	1974	1975	1976	1977	1979	1981	1983	1984	1985
Total		$699	$730	$819	$911	$1,158	$1,614	$2,152	$2,475	$2,628
Distribution by industry										
Food and kindred products	20	9	10	18	20	17	27	34	58[1]	64[1]
Paper and allied products	26	7	5	6	9	18	32	(2)	61	70
Chemicals and allied products	28	288	294	304	337	366	539	(2)	672	706
Rubber products	30	5	4	7	9	18	23	(2)	26	20
Primary metals	33	9	14	16	14	24	46	37	57	67
Fabricated metal products	34	3	5	2	2	4	8	4	7	7
Machinery	35	28	32	56	57	66	128	121	151	174
Electrical equipment	36	143	132	163	181	228	279	433	471	504
Communication equipment	366	116	109	130	150	195	(2)	305	272	286
Aircraft and missiles	372,376	57	54	54	55	88	128	146	259	304
All other industries		150	180	193	227	329	404	655	713	712

[1]Includes "tobacco products," SIC 21.
[2]Not separately available but included in total.
SOURCE: National Science Foundation, SRS

Table B-31. Funds for the performance of applied research and development by product field: selected years

[Dollars in millions]

Product field	SIC code	1970	1971	1972	1973	1974	1975	1976	1977	1979	1981	1983
Total		$17,465	$17,730	$18,959	$20,618	$22,188	$23,457	$26,178	$28,914	$37,068	$50,196	$61,232
Food and kindred products	20	206	211	227	243	283	273	308	348	420	492	636
Textile mill products	22	55	60	83	93	82	73	81	96	(2)	(2)	(2)
Chemicals, except drugs and medicines	28, except 283	1,339	1,345	1,250	1,342	1,564	1,627	1,853	2,018	2,501	3,267	4,033
Industrial inorganic and organic chemicals	281,286	442	457	451	489	589	665	728	819	(2)	1,020	1,146
Plastics materials and synthetic resins, rubber, and fibers	282	521	511	453	511	589	588	674	744	881	1,060	1,360
Agricultural chemicals	287	126	130	108	114	137	176	205	236	292	487	587
Other chemicals	284-85,289	223	218	238	229	248	198	246	220	(2)	700	940
Drugs and medicines	283	474	535	531	605	683	783	883	955	1,089	1,837	2,601
Petroleum refining and related industries	29	272	266	299	319	363	408	425	471	650	975	929
Rubber and miscellaneous plastics products	30	193	215	278	294	341	324	325	376	407	(2)	(2)
Stone, clay, and glass products	32	128	128	135	162	181	150	171	191	235	240	194
Primary metals	33	235	230	245	272	311	290	311	327	438	684	558
Ferrous metals and products	331-32 3398-99	127	114	137	158	156	144	163	172	225	268	278
Nonferrous metals and products	333-36	108	116	108	114	155	147	148	155	213	416	280
Fabricated metal products	34, except 348	622	701	731	789	903	916	1,025	1,152	1,381	1,518	1,379
Ordance and accessories, n.e.c.	348	192	192	177	228	222	187	199	268	316	453	(2)
Machinery	35	1,676	1,783	1,989	2,307	2,689	2,628	3,001	3,554	4,561	6,288	7,452
Engines and turbines	351	204	246	316	360	482	464	477	528	589	904	1,199
Farm machinery and equipment	352	89	90	93	120	131	138	168	221	295	278	290
Construction, mining and materials handling machinery	353	182	196	206	265	283	285	317	376	632	569	506
Metalworking machinery and equipment	354	86	84	76	69	74	80	83	125	340	227	244
Office, computing, and accounting machines	357	863	903	1,028	1,219	1,422	1,339	1,580	1,849	1,961	3,220	4,091
Other machinery, except electrical	355-56,358-59	252	264	270	274	297	322	376	455	744	1,090	1,122
Electrical equipment, except radio and TV receiving equipment, communication equipment, and electronic components	35, except 365-67;3825	3,372	688	775	857	929	774	874	901	980	1,724	1,874
Electric transmission and distribution equipment	361,3825		181	189	204	239	205	224	224	191	(2)	(2)
Electrical industrial apparatus	362		187	231	263	264	260	306	298	291	(2)	(2)
Other electrical equipment and supplies	363-64,368-69		320	355	390	426	309	344	379	498	653	1,003
Radio and TV receiving equipment, communication equipment, and electronic components	365-67		2,927	3,234	3,621	3,896	3,911	4,483	5,019	6,696	(2)	(2)
Motor vehicles and other transportation equipment	37 except 373,376	1,138	1,341	1,668	2,014	1,994	1,924	2,263	(2)	(2)	(2)	(2)
Motor vehicles and equipment	371	1,046	1,228	1,470	1,824	1,784	1,720	(2)	(2)	(2)	(2)	(2)
Other transportation equipment	373-75,379	90	113	198	190	210	204	193	201	205	(2)	377
Aircraft and parts	372	2,556	2,486	2,396	2,548	2,420	2,265	2,733	3,113	3,460	4,924	5,877
Guided missiles and spacecraft	376	3,115	2,832	2,647	2,491	2,486	2,925	2,880	3,024	4,465	4,814	6,904
Professional and scientific instruments	38, except 3825	724	652	847	981	1,090	1,002	1,140	1,255	1,434	1,486	1,812
Other product fields, n.e.c.	—	1,194	1,177	1,440	1,465	1,742	2,987	3,179	3,201	4,062	5,657	6,681

[1]Data not collected for 1978, 1980, 1982, and 1984.
[2]Not separately available but included in total.
NOTE: N.E.C.—not elsewhere classified.
SOURCE: National Science Foundation, SRS

Table B-32. Full-time-equivalent number of R&D scientists and engineers by industry: January 1975–86
[In thousands]

Industry and size of company	SIC code	January											
		1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total		363.3	364.4	382.8	404.4	423.9	450.6	487.8	509.8	522.1	544.5	560.2	580.3
Distribution by industry													
Food and kindred products	20	6.8	6.9	6.9	6.9	7.4	7.2	7.4	7.4	7.8	7.6	9.6[3]	10.0[3]
Textiles and apparel	22,23	1.8	1.8	1.7	1.8	1.8	(1)	2.0	1.9	2.0	2.0	2.2	1.9
Lumber, wood products, and furniture	24,25	2.3	2.1	2.1	2.0	1.8	1.7	1.6	(1)	1.8	(1)	(1)	(1)
Paper and allied products	26	5.0	5.2	6.3	6.5	7.1	7.4	8.0	8.4	8.3	7.9	8.7	9.2
Chemicals and allied products	28	45.2	44.4	46.4	48.3	50.0	51.4	54.7	61.6	66.0	67.1	67.0	71.3
Industrial chemicals	281-82,286	21.1	20.1	20.6	21.3	21.4	20.9	21.6	25.9	27.2	26.7	25.0	26.8
Drugs and medicines	283	15.6	16.6	17.8	19.5	20.8	21.6	23.3	25.6	28.2	(1)	(1)	(1)
Other chemicals	284-84,287-89	8.5	7.8	8.0	7.5	7.8	8.9	9.8	10.1	10.6	10.3	11.3	11.2
Petroleum refining and related industries	29	8.4	8.6	8.9	9.9	10.1	10.8	13.0	15.6	14.7	13.2	13.4	10.3
Rubber products	30	8.4	8.6	9.1	7.9	8.1	(1)	10.3	8.1	(1)	(1)	(1)	(1)
Stone, clay, and glass products	32	4.5	4.6	4.5	5.1	5.2	5.4	5.6	5.1	5.0	4.6	4.9	5.2
Primary metals	33	6.3	8.1	8.4	8.1	7.9	8.1	7.9	8.4	8.4	8.5	9.5	12.1
Ferrous metals and products	331-32,3398-99	3.3	3.9	3.9	4.2	4.3	4.7	4.8	5.2	5.3	5.2	6.4	8.6
Nonferrous metals and products	333-36	3.0	4.2	4.5	3.9	3.6	3.4	3.1	3.2	3.1	3.3	3.1	3.5
Fabricated metal products	34	7.4	6.8	7.1	7.0	6.8	7.8	7.8	8.2	(1)	12.9	(1)	(1)
Machinery	35	52.8	55.7	55.3	57.8	60.2	62.1	69.2	76.0	76.3	75.0	77.3	82.0
Office, computing, and accounting machines	357	36.1	38.1	37.7	38.9	40.9	41.8	43.7	48.1	49.6	50.3	52.0	57.2
Other machinery, except electrical	351-56,358-59	(2)	(2)	(2)	18.9	19.3	20.3	25.5	27.9	26.7	24.7	25.3	24.8
Electrical equipment	36	82.6	80.3	84.1	84.4	85.0	94.5	106.9	109.8	110.3	116.1	115.3	118.2
Radio and TV receiving equipment	365	1.0	1.1	.9	1.5	2.1	4.0	7.9	7.8	(1)	(1)	(1)	(1)
Communication equipment	366	40.2	37.4	38.0	39.0	40.4	42.4	44.2	45.9	47.3	56.1	56.9	59.1
Electronic components	367	10.6	10.2	13.0	14.2	14.0	18.1	22.8	24.4	24.5	(1)	(1)	(1)
Other electrical equipment	361-64,369	30.8	31.6	32.2	29.7	28.5	30.0	32.0	31.7	(1)	27.9	30.3	29.5
Motor vehicles and motor vehicles equipment	371	26.0	25.4	28.2	31.9	35.2	38.2	35.1	30.0	29.0	28.6	28.7	33.3
Other transportation equipment	373-75,379	1.9	1.7	1.9	1.9	2.0	1.5	1.4	1.2	1.9	(1)	(1)	(1)
Aircraft and missiles	372,376	67.5	66.9	72.0	82.0	86.5	85.9	95.2	91.1	95.5	96.5	103.8	106.4
Professional and scientific instruments	38	17.9	18.8	20.5	23.3	27.0	32.8	34.7	42.7	(1)	(1)	47.5	52.3
Scientific and mechanical measuring instruments	381-82	5.9	6.7	7.2	9.0	11.7	(1)	18.6	(1)	(1)	(1)	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	12.0	12.1	13.3	14.3	15.3	16.3	16.0	16.1	(1)	(1)	(1)	(1)
Other manufacturing industries	21,27,31,39	3.7	4.2	4.5	4.6	4.7	4.6	4.8	5.5	6.1	(1)	(1)	(1)
Nonmanufacturing industries	07-17,41-67,737 739,807,891	14.9	14.6	15.3	15.0	17.1	19.8	22.2	27.1	26.2	34.9	39.3	36.4

[1]Not separately available but included in total.
[2]Data not tabulated at this level prior to the 1977 survey.
[3]Includes "tobacco products," SIC 21.
SOURCE: National Science Foundation, SRS

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TABLE B-33. R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES BY SOURCE OF FUNDS, CHARACTER OF WORK, AND SCIENCE/ENGINEERING FIELD: FISCAL YEARS 1979-86

(DOLLARS IN THOUSANDS)

SOURCE, CHARACTER, AND FIELD	1979	1980	1981	1982	1983	1984	1985	1986
TOTAL	5,361,408	6,060,629	6,809,552	7,266,122	7,798,179	8,508,380	9,524,293	10,718,402
SOURCE OF FUNDS:								
FEDERAL GOVERNMENT	3,595,271	4,097,011	4,556,889	4,746,803	4,952,731	5,385,678	5,997,773	6,633,347
STATE AND LOCAL GOVERNMENTS	470,073	491,069	544,202	609,043	624,442	682,843	729,411	902,963
INDUSTRY	194,186	236,967	290,741	333,455	377,930	460,641	542,849	667,362
INSTITUTIONAL FUNDS	728,298	827,116	972,435	1,077,678	1,255,780	1,349,812	1,556,562	1,774,421
ALL OTHER SOURCES	373,580	408,466	445,285	499,143	587,296	629,406	697,697	740,309
CHARACTER OF WORK:								
BASIC RESEARCH	3,612,278	4,026,932	4,570,848	4,850,858	5,264,841	5,637,923	6,386,656	7,243,658
APPLIED RESEARCH AND DEVELOPMENT	1,749,130	2,033,697	2,238,704	2,415,264	2,533,338	2,870,457	3,137,637	3,474,744
FIELD:								
ENGINEERING, TOTAL 1/	768,407	864,924	960,677	1,025,513	1,110,811	1,207,104	1,386,717	1,609,093
AERONAUTICAL AND ASTRONAUTICAL	-	46,285	45,481	60,226	65,009	66,344	75,716	86,519
CHEMICAL	-	67,557	83,207	83,548	90,767	96,199	108,927	125,122
CIVIL	-	88,641	108,174	108,711	109,921	133,692	147,428	171,012
ELECTRICAL	-	184,050	193,080	223,862	259,283	291,795	336,932	398,203
MECHANICAL	-	146,163	149,128	142,171	149,881	176,682	205,625	224,206
OTHER, N.E.C.	-	332,228	381,607	406,995	435,950	442,391	512,088	604,031
ALL SCIENCES, TOTAL	4,593,001	5,195,705	5,848,875	6,240,609	6,687,368	7,301,276	8,137,576	9,109,309
PHYSICAL SCIENCES	601,904	677,293	764,673	822,584	897,099	991,917	1,133,913	1,261,376
ASTRONOMY	48,459	58,740	67,337	73,237	74,177	80,457	91,049	96,335
CHEMISTRY	206,421	243,982	283,899	308,091	334,663	367,843	411,615	460,084
PHYSICS	292,033	322,230	356,859	365,897	414,165	469,403	550,045	622,296
OTHER, N.E.C.	54,991	52,341	56,578	75,359	74,094	74,215	81,204	82,661
ENVIRONMENTAL SCIENCES 1/	452,915	509,038	548,920	557,817	618,962	649,601	705,357	774,177
ATMOSPHERIC	-	67,459	78,257	85,443	97,660	102,875	109,549	124,826
EARTH SCIENCES	-	188,226	189,692	195,507	216,159	225,525	250,534	261,849
OCEANOGRAPHY	-	171,668	187,463	197,701	223,994	238,157	260,306	275,524
OTHER, N.E.C.	-	81,685	93,508	79,166	81,149	83,044	84,968	111,978
MATHEMATICAL SCIENCES	78,477	78,667	88,793	98,568	108,038	124,398	129,799	152,204
COMPUTER SCIENCES	97,921	114,196	132,884	149,259	175,236	222,480	279,181	315,360
LIFE SCIENCES	2,832,523	3,217,658	3,670,596	3,969,593	4,233,143	4,617,226	5,155,422	5,746,125
AGRICULTURAL SCIENCES	602,485	679,880	772,434	844,040	895,520	930,245	1,028,549	1,122,363
BIOLOGICAL SCIENCES	914,806	1,030,429	1,186,333	1,286,548	1,408,240	1,555,330	1,697,690	1,832,910
MEDICAL SCIENCES	1,237,556	1,414,345	1,599,203	1,717,072	1,801,576	1,989,803	2,259,525	2,578,240
OTHER, N.E.C.	77,676	93,004	112,626	121,933	127,807	141,848	169,658	212,612
PSYCHOLOGY	100,531	111,290	128,328	132,322	138,505	146,884	162,047	180,453
SOCIAL SCIENCES	295,138	341,445	370,351	358,286	354,348	372,337	389,790	459,303
ECONOMICS	83,089	90,158	99,496	95,590	96,476	109,215	115,789	132,377
POLITICAL SCIENCE	45,431	55,395	56,315	61,371	55,545	56,317	60,738	68,074
SOCIOLOGY	74,641	88,556	94,658	80,252	78,327	74,626	78,643	88,311
OTHER, N.E.C.	91,977	107,336	119,882	121,073	124,000	132,178	134,620	170,542
OTHER SCIENCES, N.E.C.	133,592	146,118	144,330	152,180	162,037	176,433	182,066	220,311

1/ DETAIL NOT SEPARATELY AVAILABLE PRIOR TO 1980.

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

TABLE B-34. FEDERALLY FINANCED R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES BY CHARACTER OF WORK AND SCIENCE/ENGINEERING FIELD: FISCAL YEARS 1979-86

(DOLLARS IN THOUSANDS)

CHARACTER AND FIELD	1979	1980	1981	1982	1983	1984	1985	1986
TOTAL	3,595,271	4,097,011	4,556,889	4,746,803	4,952,731	5,385,678	5,997,773	6,633,347
CHARACTER OF WORK:								
BASIC RESEARCH	2,571,744	2,854,095	3,246,554	3,391,563	3,533,467	3,780,209	4,251,485	4,747,653
APPLIED RESEARCH AND DEVELOPMENT	1,023,527	1,242,916	1,310,335	1,355,240	1,419,264	1,605,469	1,746,288	1,885,694
FIELD:								
ENGINEERING, TOTAL 1/	526,364	595,446	662,283	697,943	737,084	778,118	856,402	968,474
AERONAUTICAL AND ASTRONAUTICAL	-	35,610	35,262	47,889	51,902	52,183	59,719	67,345
CHEMICAL	-	46,057	55,162	49,615	51,977	54,289	57,620	66,135
CIVIL	-	58,920	67,906	58,996	58,060	74,791	81,202	91,517
ELECTRICAL	-	139,621	145,390	173,799	191,871	207,267	228,574	265,885
MECHANICAL	-	99,774	102,976	97,606	101,276	117,734	132,106	144,529
OTHER, N.E.C.	-	215,464	255,587	270,038	281,998	271,853	297,181	333,063
ALL SCIENCES, TOTAL	3,068,907	3,501,565	3,894,606	4,048,860	4,215,647	4,607,561	5,141,370	5,664,873
PHYSICAL SCIENCES	490,680	554,819	618,053	648,917	697,447	778,610	882,504	975,516
ASTRONOMY	36,245	44,441	47,828	51,675	50,370	53,111	60,112	64,009
CHEMISTRY	156,516	189,427	216,052	230,302	247,652	277,957	307,214	337,913
PHYSICS	252,518	279,890	308,549	306,025	339,909	388,188	454,993	509,574
OTHER, N.E.C.	45,401	41,061	45,624	60,915	59,516	59,353	60,186	64,021
ENVIRONMENTAL SCIENCES 1/	329,154	372,533	391,727	391,159	426,847	450,967	477,550	520,137
ATMOSPHERIC	-	55,524	58,690	68,297	75,943	82,107	86,431	99,485
EARTH SCIENCES	-	131,272	127,927	126,996	135,808	139,410	152,825	150,942
OCEANOGRAPHY	-	132,726	145,923	153,574	171,352	183,582	191,791	207,095
OTHER, N.E.C.	-	53,011	59,187	42,292	43,744	45,868	46,504	62,615
MATHEMATICAL SCIENCES	60,431	61,114	67,672	71,837	76,397	91,064	95,691	112,364
COMPUTER SCIENCES	69,192	76,982	93,452	106,918	127,697	161,555	193,154	227,428
LIFE SCIENCES	1,818,779	2,094,873	2,362,586	2,492,608	2,563,362	2,796,038	3,140,747	3,439,947
AGRICULTURAL SCIENCES	184,676	211,897	233,656	254,756	259,663	270,074	298,377	298,075
BIOLOGICAL SCIENCES	664,675	763,373	865,465	920,822	983,318	1,087,778	1,192,986	1,278,995
MEDICAL SCIENCES	914,905	1,056,561	1,187,179	1,238,622	1,242,736	1,349,158	1,547,246	1,738,382
OTHER, N.E.C.	54,523	63,042	76,286	78,408	77,645	89,028	102,138	124,495
PSYCHOLOGY	72,257	81,193	92,457	89,086	90,599	98,379	107,480	118,449
SOCIAL SCIENCES	155,074	181,627	186,978	161,795	147,573	144,892	154,647	166,948
ECONOMICS	40,026	43,430	44,508	41,199	37,072	41,953	42,450	42,878
POLITICAL SCIENCE	20,561	23,676	23,362	22,521	19,926	18,305	20,073	19,731
SOCIOLOGY	47,144	57,140	56,353	45,965	42,405	38,559	40,256	43,685
OTHER, N.E.C.	47,343	57,381	62,755	52,110	48,170	46,076	51,867	60,655
OTHER SCIENCES, N.E.C.	73,340	78,424	81,681	86,540	85,725	86,056	89,597	104,083

1/ DETAIL NOT SEPARATELY AVAILABLE PRIOR TO 1980.

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

TABLE B-35. CAPITAL EXPENDITURES AT UNIVERSITIES AND COLLEGES BY SCIENCE/ENGINEERING FIELD AND SOURCE OF FUNDS: FISCAL YEARS 1979-86 1/

(DOLLARS IN THOUSANDS)

FIELD	1979	1980	1981	1982	1983	1984	1985	1986
TOTAL	696,218	794,512	952,672	969,147	1,098,941	1,215,249	1,312,657	1,578,818
ENGINEERING	87,128	89,297	103,329	144,457	134,980	142,894	187,320	316,440
ALL SCIENCES, TOTAL	609,090	705,215	849,343	824,690	963,961	1,072,355	1,125,337	1,262,378
PHYSICAL SCIENCES	64,685	77,154	87,813	82,100	97,467	116,071	131,108	152,808
ENVIRONMENTAL SCIENCES	25,153	36,208	35,025	42,365	41,112	36,814	54,053	47,111
MATHEMATICAL/COMPUTER SCIENCES	27,282	32,318	30,517	34,328	53,098	49,971	75,657	91,088
LIFE SCIENCES	428,293	459,057	597,635	590,353	678,778	741,416	751,646	839,906
PSYCHOLOGY	7,060	17,982	10,991	12,798	17,012	35,205	20,900	25,472
SOCIAL SCIENCES	21,358	35,073	45,138	30,797	40,870	51,933	61,849	50,711
OTHER SCIENCES, N.E.C.	35,259	47,423	42,224	31,949	35,624	40,946	30,125	55,282
FEDERAL SOURCES, TOTAL	164,460	149,563	153,800	116,651	131,517	141,728	144,296	193,120
ENGINEERING	20,927	20,438	17,601	18,136	16,163	24,013	16,778	33,635
ALL SCIENCES, TOTAL	143,533	129,125	136,199	98,515	115,354	117,715	127,519	159,485
PHYSICAL SCIENCES	32,186	22,463	25,529	20,154	18,579	18,916	31,300	35,089
ENVIRONMENTAL SCIENCES	8,220	8,033	6,866	4,404	3,644	3,490	3,547	6,184
MATHEMATICAL/COMPUTER SCIENCES	2,983	5,653	4,944	3,798	4,458	5,296	6,718	14,048
LIFE SCIENCES	90,796	86,105	89,410	66,004	81,016	85,412	80,829	94,310
PSYCHOLOGY	1,740	2,002	1,580	1,023	1,365	1,008	820	1,266
SOCIAL SCIENCES	2,076	1,528	6,376	1,374	4,959	2,932	2,096	2,505
OTHER SCIENCES, N.E.C.	5,532	3,341	1,494	1,758	1,333	660	2,209	6,082
OTHER SOURCES, TOTAL	531,758	644,949	798,872	852,496	967,424	1,073,521	1,168,361	1,385,698
ENGINEERING	66,201	68,859	85,728	126,321	118,817	118,881	170,542	282,805
ALL SCIENCES, TOTAL	465,557	576,090	713,144	726,175	848,607	954,640	997,818	1,102,893
PHYSICAL SCIENCES	32,499	54,691	62,284	61,946	78,888	97,154	99,808	117,719
ENVIRONMENTAL SCIENCES	16,933	28,175	28,159	37,961	37,468	33,324	50,506	40,927
MATHEMATICAL/COMPUTER SCIENCES	24,299	26,665	25,573	30,530	48,640	44,675	68,939	77,040
LIFE SCIENCES	337,497	372,952	508,225	524,349	597,762	656,004	670,817	745,596
PSYCHOLOGY	5,320	15,980	9,411	11,775	15,647	34,197	20,080	24,206
SOCIAL SCIENCES	19,282	33,545	38,762	29,423	35,911	49,001	59,753	48,206
OTHER SCIENCES, N.E.C.	29,727	44,082	40,730	30,191	34,291	40,286	27,916	49,200

1/ INCLUDES EXPENDITURES FOR FACILITIES AND EQUIPMENT FOR RESEARCH, DEVELOPMENT, AND INSTRUCTION.

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

TABLE B-36. R&D EXPENDITURES AT UNIVERSITY-ADMINISTERED FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS BY CHARACTER OF WORK AND SCIENCE/ENGINEERING FIELD: FISCAL YEARS 1979-86

(DOLLARS IN THOUSANDS)

CHARACTER AND FIELD	1979	1980	1981	1982	1983	1984	1985	1986
TOTAL	1,934,797	2,245,773	2,485,853	2,478,721	2,736,652	3,117,716	3,529,109	3,900,070
CHARACTER OF WORK:								
BASIC RESEARCH	718,303	785,774	863,179	869,701	982,272	1,052,027	1,078,224	1,120,528
APPLIED RESEARCH AND DEVELOPMENT	1,216,494	1,459,999	1,622,674	1,609,020	1,754,380	2,065,689	2,450,885	2,779,542
FIELD:								
ENGINEERING, TOTAL 1/	561,083	644,910	656,426	636,158	944,952	1,109,866	1,312,412	1,461,621
AERONAUTICAL AND ASTRONAUTICAL	-	24,778	60,339	59,409	69,057	86,022	107,065	126,566
CHEMICAL	-	38,406	47,454	44,988	45,832	46,718	49,928	49,894
CIVIL	-	18,874	16,052	17,952	13,378	13,596	15,597	16,014
ELECTRICAL	-	200,981	169,059	171,470	316,652	394,283	458,596	518,626
MECHANICAL	-	135,858	185,448	181,017	339,573	398,073	490,934	541,568
OTHER, N.E.C.	-	226,013	178,074	161,322	160,460	171,174	190,292	208,953
ALL SCIENCES, TOTAL	1,373,714	1,600,863	1,829,427	1,842,563	1,791,700	2,007,850	2,216,697	2,438,449
PHYSICAL SCIENCES	1,003,562	1,127,323	1,270,539	1,315,626	1,196,457	1,326,957	1,429,829	1,521,412
ASTRONOMY	46,099	59,025	67,578	65,885	73,498	80,188	76,603	82,650
CHEMISTRY	101,142	150,540	167,148	161,548	200,505	232,052	244,992	265,409
PHYSICS	584,519	829,217	950,865	982,245	885,500	982,449	1,068,356	1,129,765
OTHER, N.E.C.	271,802	88,541	84,948	105,948	36,954	32,268	39,878	43,588
ENVIRONMENTAL SCIENCES 1/	141,100	174,724	186,526	157,962	154,642	174,197	202,440	234,588
ATMOSPHERIC	-	35,703	48,433	55,325	56,749	63,700	80,605	95,780
EARTH SCIENCES	-	59,990	42,715	37,334	37,795	40,936	46,623	50,392
OCEANOGRAPHY	-	4,306	14,276	12,201	13,068	15,958	17,061	20,494
OTHER, N.E.C.	-	74,725	81,102	53,102	47,030	53,603	58,151	67,922
MATHEMATICAL SCIENCES	6,614	31,089	38,561	42,091	65,340	81,217	92,837	109,078
COMPUTER SCIENCES	120,236	131,025	188,066	177,106	224,274	268,501	341,483	430,657
LIFE SCIENCES	73,441	76,889	85,164	84,269	104,484	106,555	117,943	114,444
AGRICULTURAL SCIENCES	1,551	645	570	2,528	1,008	639	633	663
BIOLOGICAL SCIENCES	62,659	57,006	66,406	62,180	76,437	82,986	91,148	94,195
MEDICAL SCIENCES	7,179	8,194	8,453	8,575	9,555	9,079	8,676	6,510
OTHER, N.E.C.	2,052	11,044	9,735	10,986	17,484	13,851	17,486	13,076
PSYCHOLOGY	110	135	147	155	194	240	264	294
SOCIAL SCIENCES	5,861	17,449	20,984	21,412	21,067	18,056	17,591	19,343
ECONOMICS	3,735	9,657	6,002	4,556	4,254	3,590	4,401	4,043
POLITICAL SCIENCE	2,126	2,422	3,439	3,428	3,955	3,319	4,038	4,994
SOCIOLOGY	0	1,500	2,259	2,487	0	0	0	0
OTHER, N.E.C.	0	3,870	9,284	10,941	12,858	11,147	9,152	10,306
OTHER SCIENCES, N.E.C.	22,790	42,229	39,440	43,942	25,242	32,127	14,310	8,633

1/ DETAIL NOT SEPARATELY AVAILABLE PRIOR TO 1980.

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

TABLE B-37. SCIENCE/ENGINEERING POSTDOCTORATES IN DOCTORATE-GRANTING INSTITUTIONS BY FIELD: 1980-86

FIELD	NUMBER							AVERAGE ANNUAL PERCENT CHANGE		
	1980	1981	1982	1983	1984	1985	1986	1980-85	1985-86	1980-86
TOTAL, ALL FIELDS	18,411	19,646	19,366	20,761	21,587	22,598	24,136	4.2	6.8	4.6
ENGINEERING	978	1,040	978	1,102	1,195	1,349	1,420	6.6	5.3	6.4
AEROSPACE	20	14	25	32	42	51	48	20.6	-5.9	15.7
AGRICULTURAL	9	9	6	4	8	15	17	10.8	13.3	11.2
BIOMEDICAL	28	34	31	28	34	47	52	10.9	10.6	10.9
CHEMICAL	183	171	174	198	245	273	295	8.3	8.1	8.3
CIVIL	124	107	108	131	146	122	140	-.3	14.8	2.0
ELECTRICAL	121	191	176	174	171	176	172	7.8	-2.3	6.0
ENGINEERING SCIENCE	79	87	76	71	63	90	73	2.6	-18.9	-1.3
INDUSTRIAL	16	13	9	14	22	20	29	4.6	45.0	10.4
MECHANICAL	137	130	130	182	196	202	239	8.1	18.3	9.7
METALLURGICAL/MATERIALS	172	193	166	204	168	245	249	7.3	1.6	6.4
MINING	3	16	10	19	18	19	25	44.7	31.6	42.4
NUCLEAR	22	26	18	15	19	31	31	7.1	.0	5.9
PETROLEUM	6	2	4	1	4	6	1	.0	-83.3	-25.8
ENGINEERING, N.E.C.	58	47	45	29	53	52	49	-2.2	-5.8	-2.8
SCIENCES, TOTAL	17,433	18,606	18,388	19,659	20,392	21,249	22,716	4.0	6.9	4.5
PHYSICAL SCIENCES	4,264	4,462	4,281	4,444	4,386	4,517	4,813	1.2	6.6	2.0
ASTRONOMY	141	132	148	111	118	138	133	-.4	-3.6	-1.0
CHEMISTRY	2,710	2,870	2,805	2,973	2,906	2,995	3,151	2.0	5.2	2.5
PHYSICS	1,398	1,445	1,326	1,350	1,320	1,342	1,497	-.8	11.5	1.1
PHYSICAL SCIENCES, N.E.C.	15	15	2	10	42	42	32	22.9	-23.8	13.5
ENVIRONMENTAL SCIENCES	308	339	335	415	488	375	418	4.0	11.5	5.2
ATMOSPHERIC SCIENCES	43	46	32	41	74	48	43	2.2	-10.4	.0
GEOSCIENCES	194	213	216	237	250	226	247	3.1	9.3	4.1
OCEANOGRAPHY	57	67	78	120	151	79	98	6.7	24.1	9.5
ENVIRONMENTAL SCIENCES, N.E.C.	14	13	9	17	13	22	30	9.5	36.4	13.5
MATHEMATICAL SCIENCES	162	113	194	170	203	226	201	6.9	-11.1	3.7
COMPUTER SCIENCES	43	34	46	82	63	74	74	11.5	.0	9.5
LIFE SCIENCES	11,743	12,855	12,725	13,756	14,473	15,191	16,328	5.3	7.5	5.6
AGRICULTURAL SCIENCES	239	284	279	295	358	357	388	8.4	8.7	8.4
BIOLOGICAL SCIENCES	7,106	7,706	7,756	8,386	8,740	9,229	9,857	5.4	6.8	5.6
ANATOMY	237	248	261	284	282	310	342	5.5	10.3	6.3
BIOCHEMISTRY	1,599	1,724	1,684	1,765	1,803	1,892	2,027	3.4	7.1	4.0
BIOLOGY	989	870	942	1,014	1,127	1,128	1,109	2.7	-1.7	1.9
BIOMETRY/EPIDEMIOLOGY	72	64	53	54	67	59	99	-3.9	67.8	5.5
BIOPHYSICS	151	155	129	183	121	101	133	-7.7	31.7	-2.1
BOTANY	220	240	298	369	347	371	394	11.0	6.2	10.2
CELL BIOLOGY	410	532	516	653	648	731	827	12.3	13.1	12.4
ECOLOGY	22	44	28	39	36	37	37	11.0	.0	9.1
ENTOMOLOGY/PARASITOLOGY	119	133	119	112	113	139	143	3.2	2.9	3.1
GENETICS	258	298	314	344	382	377	428	7.9	13.5	8.8
MICROBIOLOGY	873	967	1,014	1,025	1,071	1,168	1,274	6.0	9.1	6.5
NUTRITION	129	171	138	150	150	202	185	9.4	-8.4	6.2
PATHOLOGY	477	468	540	584	607	621	709	5.4	14.2	6.8
PHARMACOLOGY	624	755	777	801	816	861	885	6.7	2.8	6.0
PHYSIOLOGY	668	758	673	754	817	840	906	4.7	7.9	5.2
ZOOLOGY	193	207	203	183	157	212	217	1.9	2.4	2.0
BIOSCIENCES, N.E.C.	65	72	67	72	196	180	142	22.6	-21.1	13.9
HEALTH SCIENCES	4,398	4,865	4,690	5,075	5,375	5,605	6,083	5.0	8.5	5.6
DENTISTRY	79	139	246	197	186	224	127	23.2	-43.3	8.2
NEUROLOGY	283	287	254	301	352	332	419	3.2	26.2	6.8
NURSING	9	8	0	6	14	17	16	13.6	-5.9	10.1
PHARMACEUTICAL SCIENCES	233	243	238	241	269	318	384	6.4	20.8	8.7
PREVENTIVE MEDICINE/ COMMUNITY HEALTH	161	135	143	142	168	167	194	.7	16.2	3.2
SPEECH PATHOLOGY/AUDIOLOGY	18	19	10	18	18	18	12	.0	-33.3	-6.5
VETERINARY SCIENCES	52	31	49	50	78	69	100	5.8	44.9	11.5
CLINICAL MEDICINE, N.E.C.	3,461	3,890	3,658	4,004	4,172	4,322	4,652	4.5	7.6	5.1
HEALTH RELATED, N.E.C.	102	113	92	116	118	138	179	6.2	29.7	9.8
PSYCHOLOGY	475	471	520	435	422	498	526	1.0	5.6	1.7
SOCIAL SCIENCES	438	332	287	357	357	368	356	-3.4	-3.3	-3.4
AGRICULTURAL ECONOMICS	8	6	10	28	18	31	35	31.1	12.9	27.9
ANTHROPOLOGY	40	30	34	60	57	57	52	7.3	-8.8	4.5
ECONOMICS (EXCEPT AGRICULTURAL)	146	30	13	20	26	19	22	-33.5	15.8	-27.1
GEOGRAPHY	15	23	5	7	14	10	11	-7.8	10.0	-5.0
HISTORY AND PHILOSOPHY OF SCIENCE	15	21	14	19	12	11	11	-6.0	.0	-5.0
LINGUISTICS	54	47	47	51	30	26	25	-13.6	-3.8	-12.0
POLITICAL SCIENCE	30	46	44	43	31	44	66	8.0	50.0	14.0
SOCIOLOGY	99	90	89	99	114	92	84	-1.5	-8.7	-2.7
SOCIOLOGY/ANTHROPOLOGY	3	0	2	1	0	2	1	-7.8	-50.0	-16.7
SOCIAL SCIENCES, N.E.C.	28	39	29	29	55	76	49	22.1	-35.5	9.8

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS.

TABLE B-38. FULL-TIME SCIENCE/ENGINEERING GRADUATE STUDENTS WITH RESEARCH ASSISTANTSHIPS IN DOCTORATE-GRANTING INSTITUTIONS BY FIELD: 1980-86

FIELD	NUMBER							AVERAGE ANNUAL PERCENT CHANGE		
	1980	1981	1982	1983	1984	1985	1986	1980-85	1985-86	1980-86
TOTAL, ALL FIELDS	50,781	51,946	51,828	54,146	56,946	60,448	65,560	3.5	8.5	4.3
ENGINEERING	13,928	14,394	14,595	15,581	16,206	17,858	20,407	5.1	14.3	6.6
AEROSPACE	580	583	617	691	673	725	823	4.6	13.5	6.0
AGRICULTURAL	362	398	427	433	439	410	447	2.5	9.0	3.6
BIOMEDICAL	215	253	304	326	391	415	518	14.1	24.8	15.8
CHEMICAL	1,844	2,018	2,097	2,253	2,325	2,454	2,581	5.9	5.2	5.8
CIVIL	2,190	2,196	2,104	2,351	2,480	2,469	2,829	2.4	14.6	4.4
ELECTRICAL	2,830	2,860	2,933	3,180	3,129	3,643	4,393	5.2	20.6	7.6
ENGINEERING SCIENCE	432	491	493	439	456	496	559	2.8	12.7	4.4
INDUSTRIAL	586	539	535	446	554	586	724	.0	23.5	3.6
MECHANICAL	2,045	2,134	2,200	2,347	2,632	3,254	3,661	9.7	12.5	10.2
METALLURGICAL/MATERIALS	1,390	1,553	1,512	1,675	1,749	1,961	2,238	7.1	14.1	8.3
MINING	120	161	137	122	142	143	158	3.6	10.5	4.7
NUCLEAR	508	480	412	436	435	460	506	-2.0	10.0	-.1
PETROLEUM	104	118	100	158	158	151	158	7.7	4.6	7.2
ENGINEERING, N.E.C.	722	610	724	724	643	691	812	-.9	17.5	2.0
SCIENCES, TOTAL	36,853	37,552	37,233	38,565	40,740	42,590	45,153	2.9	6.0	3.4
PHYSICAL SCIENCES	8,258	8,524	8,683	9,060	9,517	10,174	10,847	4.3	6.6	4.6
ASTRONOMY	270	263	250	279	307	305	323	2.5	5.9	3.0
CHEMISTRY	4,539	4,730	4,838	5,118	5,312	5,727	6,103	4.8	6.6	5.1
PHYSICS	3,445	3,516	3,569	3,626	3,865	4,097	4,374	3.5	6.8	4.1
PHYSICAL SCIENCES, N.E.C.	4	15	26	37	33	45	47	62.3	4.4	50.8
ENVIRONMENTAL SCIENCES	3,664	3,402	3,265	3,481	3,506	3,676	3,789	.1	3.1	.6
ATMOSPHERIC SCIENCES	488	455	456	432	429	446	418	-1.8	-6.3	-2.5
GEOSCIENCES	2,014	1,796	1,762	1,959	1,945	2,121	2,086	1.0	-1.7	.6
OCEANOGRAPHY	800	791	780	784	837	845	943	1.1	11.6	2.8
ENVIRONMENTAL SCIENCES, N.E.C.	362	360	267	306	295	264	342	-6.1	29.5	-.9
MATHEMATICAL SCIENCES	773	732	822	775	846	969	1,012	4.6	4.4	4.6
COMPUTER SCIENCES	1,023	1,068	1,151	1,367	1,582	2,020	2,284	14.6	13.1	14.3
LIFE SCIENCES	15,477	15,925	15,825	16,061	17,229	17,657	18,991	2.7	7.6	3.5
AGRICULTURAL SCIENCES	4,484	4,647	4,558	4,509	4,612	4,308	4,612	-.8	7.1	.5
BIOLOGICAL SCIENCES	9,545	9,801	9,774	9,986	10,820	11,189	12,059	3.2	7.8	4.0
ANATOMY	142	138	141	149	182	180	181	4.9	.6	4.1
BIOCHEMISTRY	1,454	1,549	1,617	1,740	1,923	2,040	2,245	7.0	10.0	7.5
BIOLOGY	1,245	1,260	1,201	1,275	1,329	1,285	1,461	.6	13.7	2.7
BIOMETRY/EPIDEMIOLOGY	117	100	99	100	119	124	159	1.2	28.2	5.2
BIOPHYSICS	161	124	131	157	154	153	199	-1.0	30.1	3.6
BOTANY	1,282	1,253	1,327	1,165	1,302	1,226	1,207	-.9	-1.5	-1.0
CELL BIOLOGY	210	266	296	363	433	453	608	16.6	34.2	19.4
ECOLOGY	272	221	233	202	231	232	266	-3.1	14.7	-.4
ENTOMOLOGY/PARASITOLOGY	890	806	764	771	717	686	680	-5.1	-.9	-4.4
GENETICS	235	252	260	238	235	308	418	5.6	35.7	10.1
MICROBIOLOGY	933	1,033	1,024	1,133	1,247	1,396	1,420	8.4	1.7	7.3
NUTRITION	1,135	1,114	1,066	1,059	1,126	1,124	1,102	-.2	-2.0	-.5
PATHOLOGY	165	177	205	222	259	275	307	10.8	11.6	10.9
PHARMACOLOGY	349	438	414	456	451	519	548	8.3	5.6	7.8
PHYSIOLOGY	417	462	432	382	494	542	597	5.4	10.1	6.2
ZOOLOGY	380	436	372	375	341	321	308	-3.3	-4.0	-3.4
BIOSCIENCES, N.E.C.	158	172	192	199	277	325	353	15.5	8.6	14.3
HEALTH SCIENCES	1,448	1,477	1,493	1,566	1,797	2,160	2,320	8.3	7.4	8.2
DENTISTRY	26	10	12	8	18	10	12	-17.4	20.0	-12.1
NEUROLOGY	51	33	49	53	82	96	111	13.5	15.6	13.8
NURSING	101	107	128	160	232	249	313	19.8	25.7	20.7
PHARMACEUTICAL SCIENCES	400	407	376	409	459	494	518	4.3	4.9	4.4
PREVENTIVE MEDICINE/ COMMUNITY HEALTH	185	233	202	166	178	219	312	3.4	42.5	9.1
SPEECH PATHOLOGY/AUDIOLOGY	267	251	302	277	217	303	329	2.6	8.6	3.5
VETERINARY SCIENCES	157	167	161	163	203	263	252	10.9	-4.2	8.2
CLINICAL MEDICINE, N.E.C.	118	108	135	179	156	196	190	10.7	-3.1	8.3
HEALTH RELATED, N.E.C.	143	161	128	151	252	330	283	18.2	-14.2	12.0
PSYCHOLOGY	2,342	2,664	2,510	2,657	2,762	2,867	2,889	4.1	.8	3.6
SOCIAL SCIENCES	5,316	5,237	4,977	5,164	5,298	5,227	5,341	-.3	2.2	.1
AGRICULTURAL ECONOMICS	962	936	829	814	858	831	923	-2.9	11.1	-.7
ANTHROPOLOGY	349	303	314	281	292	270	276	-5.0	2.2	-3.8
ECONOMICS (EXCEPT AGRICULTURAL)	1,185	1,153	1,024	1,138	1,045	1,074	1,043	-1.9	-2.9	-2.1
GEOGRAPHY	249	229	213	230	274	297	271	3.6	-8.8	1.4
HISTORY AND PHILOSOPHY OF SCIENCE	14	16	11	7	10	11	23	-4.7	109.1	8.6
LINGUISTICS	143	180	140	136	135	163	126	2.7	-22.7	-2.1
POLITICAL SCIENCE	852	841	882	948	1,020	967	956	2.6	-1.1	1.9
SOCIOLOGY	732	713	633	575	628	625	611	-3.1	-2.2	-3.0
SOCIOLOGY/ANTHROPOLOGY	81	120	127	120	120	103	115	4.9	11.7	6.0
SOCIAL SCIENCES, N.E.C.	749	746	804	915	916	886	997	3.4	12.5	4.9

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS.

Table B-39. Scientists and engineers by field, sex, and employment status: 1976 and 1986

Field and sex	1976					1986				
	Total population	Total employed	Employed in science/ engineering	Unemployed, seeking	Outside the labor force	Total population	Total employed	Employed in science/ engineering	Unemployed, seeking	Outside the labor force
Total, all fields	2,530,100	2,331,200	2,122,100	82,100	116,800	4,971,900	4,626,500	3,919,900	72,700	272,700
Men	2,295,300	2,131,600	1,947,200	70,700	93,000	4,207,400	3,927,800	3,393,700	53,400	226,200
Women	234,800	199,700	174,900	11,300	23,800	764,400	698,600	526,200	19,400	46,500
Total scientists	1,048,400	959,500	843,800	36,500	52,400	2,337,000	2,186,300	1,676,400	41,900	108,700
Men	837,900	781,300	689,100	25,700	30,800	1,681,000	1,586,700	1,242,800	25,100	69,100
Women	210,600	178,200	154,700	10,700	21,600	656,000	599,600	433,600	16,800	39,600
Physical scientists	203,900	188,900	154,900	5,900	9,100	312,600	288,400	264,900	4,200	20,000
Men	185,400	172,700	143,600	5,200	7,500	269,100	250,100	229,500	3,000	16,000
Women	18,500	16,200	11,300	700	1,500	43,600	38,300	35,400	1,200	4,000
Mathematical scientists	55,000	48,600	43,800	2,500	3,800	140,300	131,000	103,900	1,700	7,500
Men	40,700	37,100	33,700	1,900	1,700	102,600	97,100	78,900	800	4,700
Women	14,300	11,500	10,000	700	2,100	37,700	33,900	25,000	900	2,800
Computer specialists	125,900	119,000	116,000	3,000	3,900	575,800	562,600	437,200	4,800	8,400
Men	101,600	98,400	95,100	1,800	1,400	404,600	400,000	308,700	2,200	2,400
Women	24,300	20,600	20,900	1,200	2,500	171,200	162,500	128,400	2,600	6,000
Environmental scientists	58,300	54,800	46,600	1,200	2,300	123,200	111,300	97,300	5,100	6,800
Men	53,800	50,900	44,000	1,000	1,800	108,000	98,400	87,200	4,000	5,600
Women	4,500	3,900	2,600	100	500	15,200	12,900	10,100	1,200	1,200
Life scientists	230,700	213,500	198,200	6,300	10,900	452,100	411,800	340,500	8,800	31,500
Men	191,800	179,600	167,700	4,900	7,300	333,900	309,000	257,100	5,200	19,700
Women	38,900	33,900	30,500	1,400	3,600	118,200	102,800	83,300	3,600	11,800
Psychologists	122,500	112,500	103,700	5,700	4,300	273,600	253,500	172,800	6,600	13,500
Men	81,800	76,900	71,600	3,300	1,600	149,100	138,400	99,500	3,100	7,700
Women	40,700	35,600	32,000	2,400	2,700	124,500	115,200	73,300	3,600	5,800
Social scientists	252,200	222,300	180,500	11,900	18,100	459,400	427,800	259,800	10,600	21,000
Men	182,800	165,700	133,200	7,600	9,500	313,700	293,800	181,800	6,800	13,100
Women	69,400	56,600	47,300	4,200	8,600	145,700	134,000	78,000	3,700	7,900
Total engineers	1,481,700	1,371,700	1,278,300	45,600	64,400	2,634,900	2,440,100	2,243,500	30,800	164,000
Men	1,457,500	1,350,300	1,258,100	45,000	62,200	2,526,400	2,341,100	2,150,900	28,200	157,100
Women	24,200	21,400	20,200	600	2,200	108,400	99,000	92,600	2,600	6,900
Aeronautical/astronautical	62,300	56,800	55,700	2,400	3,200	117,300	110,500	104,200	500	6,200
Men	61,500	56,400	55,100	2,400	2,700	112,800	106,200	100,300	400	6,200
Women	900	400	600	(2)	400	4,500	4,300	3,900	100	100
Chemical	83,900	77,500	76,400	1,800	4,600	171,700	149,000	131,500	4,000	18,600
Men	81,000	75,000	73,700	1,600	4,400	158,700	137,800	121,200	3,600	17,300
Women	3,000	2,500	2,800	200	200	13,000	11,200	10,300	500	1,300
Civil	201,800	188,200	182,800	5,300	8,400	381,400	346,300	319,100	5,900	29,300
Men	195,900	182,800	178,100	4,900	8,200	367,400	333,400	307,200	5,400	28,600
Women	6,000	5,400	4,800	400	100	14,100	12,900	11,900	500	700
Electrical/electronics	295,600	283,000	267,900	5,100	7,600	620,700	574,500	540,800	6,200	40,100
Men	293,200	281,400	266,500	5,100	6,700	599,400	555,500	523,200	6,000	37,900
Women	2,400	1,600	1,400	(2)	900	21,300	18,900	17,600	200	2,100
Industrial	(1)	(1)	(1)	(1)	(1)	144,900	137,700	113,100	1,500	5,700
Men	(1)	(1)	(1)	(1)	(1)	137,500	130,600	106,600	1,400	5,500
Women	(1)	(1)	(1)	(1)	(1)	7,400	7,100	6,500	100	200
Materials	(1)	(1)	(1)	(1)	(1)	57,400	53,100	46,800	900	3,400
Men	(1)	(1)	(1)	(1)	(1)	54,100	50,500	44,500	400	3,200
Women	(1)	(1)	(1)	(1)	(1)	3,300	2,500	2,300	500	200
Mechanical	297,800	276,200	272,800	12,300	9,300	547,800	492,600	453,700	6,700	48,400
Men	295,400	273,900	270,600	12,300	9,200	532,300	478,600	440,100	6,400	47,300
Women	2,500	2,300	2,200	(2)	100	15,500	14,000	13,600	400	1,100
Other engineers	540,100	490,000	422,700	18,700	31,300	593,700	576,400	534,300	5,000	12,300
Men	530,600	480,900	414,200	18,700	30,900	564,300	548,400	507,800	4,700	11,100
Women	9,500	9,100	8,500	(2)	400	29,400	27,900	26,400	300	1,100

[1]Detail unavailable.
[2]Too few cases to estimate.
NOTE: Because of rounding, detail may not add to totals.
SOURCE: National Science Foundation, SRS

Table B-40. Employed scientists and engineers by field, sex, and sector of employment: 1976 and 1986

Field and sex	1976						1986					
	Total	Industry	Educational institutions	Federal Government	State/local/ other government	Other[3]	Total	Industry	Educational institutions	Federal Government	State/local/ other government	Other[3]
Total, all fields	2,331,200	1,456,500	287,600	219,200	137,400	230,500	4,626,500	3,134,500	627,000	354,100	241,700	269,200
Men	2,131,600	1,385,100	232,400	200,600	119,900	193,600	3,927,800	2,741,700	479,200	310,400	202,000	194,500
Women	199,700	71,400	55,200	18,500	17,600	37,000	698,600	392,800	147,800	43,700	39,700	74,600
Total scientists	959,500	430,300	248,000	110,700	62,200	108,300	2,186,300	1,193,700	526,200	167,900	125,900	172,600
Men	781,300	373,200	194,000	93,600	47,100	73,400	1,586,700	876,200	385,000	131,800	90,400	103,300
Women	178,200	57,100	54,000	17,000	15,100	35,000	599,600	317,500	141,100	36,100	35,500	69,400
Physical scientists	188,900	105,400	39,100	22,400	5,900	16,100	288,400	163,700	71,100	29,700	8,400	15,500
Men	172,700	97,200	34,400	20,900	5,400	14,800	250,100	142,700	61,500	27,000	6,800	12,100
Women	16,200	8,200	4,700	1,500	500	1,300	38,300	20,900	9,600	2,700	1,700	3,400
Mathematical scientists	48,600	15,000	21,100	9,000	1,300	2,200	131,000	54,700	58,700	11,100	2,200	4,300
Men	37,100	12,000	15,700	7,200	700	1,500	97,100	41,900	43,400	8,100	1,200	2,500
Women	11,500	2,900	5,500	1,800	600	700	33,900	12,800	15,300	3,000	1,100	1,700
Computer specialists	119,000	86,800	6,900	9,300	5,100	10,900	562,600	439,700	37,700	38,500	20,700	26,000
Men	98,400	72,300	5,800	7,700	4,100	8,500	400,000	315,700	24,900	27,000	13,900	18,500
Women	20,600	14,500	1,100	1,600	1,000	2,400	162,500	124,000	12,800	11,500	6,800	7,400
Environmental scientists	54,800	30,900	6,100	10,100	2,200	5,500	111,300	65,100	18,200	17,600	5,900	4,500
Men	50,900	28,900	5,200	9,300	2,100	5,400	98,400	58,400	15,800	15,500	5,100	3,600
Women	3,900	2,000	900	800	100	100	12,900	6,800	2,400	2,200	700	800
Life scientists	213,500	71,500	63,300	39,300	20,300	19,100	411,800	153,100	147,900	42,400	31,600	36,800
Men	179,600	63,600	50,800	34,200	17,700	13,300	309,000	117,600	111,000	33,100	25,600	21,700
Women	33,900	7,900	12,600	5,200	2,600	5,600	102,800	35,500	37,000	9,300	6,000	15,000
Psychologists	112,500	26,400	43,800	5,200	7,600	29,500	253,500	101,800	79,400	6,900	14,800	50,600
Men	76,900	20,400	29,900	3,100	5,100	18,400	138,400	51,300	47,900	3,700	9,200	26,300
Women	35,600	6,000	13,900	2,100	2,500	11,100	115,200	50,500	31,500	3,200	5,600	24,400
Social scientists	222,300	94,400	67,700	15,300	19,900	25,000	427,800	215,500	113,100	21,800	42,300	35,100
Men	165,700	78,800	52,300	11,200	11,900	11,500	293,800	148,600	80,600	17,500	28,700	18,400
Women	56,600	15,600	15,500	4,000	7,800	13,700	134,000	66,900	32,500	4,200	13,600	16,800
Total engineers	1,371,700	1,026,200	39,600	108,500	75,200	122,200	2,440,100	1,940,800	100,900	186,200	115,800	96,400
Men	1,350,300	1,011,900	38,400	107,000	72,800	120,200	2,341,100	1,865,500	94,100	178,500	111,500	91,500
Women	21,400	14,300	1,200	1,500	2,500	1,900	99,000	75,300	6,700	7,600	4,300	5,100
Aeronautical/astronautical	56,800	40,300	1,800	11,100	700	2,900	110,500	80,900	3,800	17,700	400	7,700
Men	56,400	39,900	1,800	11,100	700	2,900	106,200	78,500	3,600	16,800	400	6,900
Women	400	400	[1]	[1]	[1]	[1]	4,300	2,300	200	900	[1]	900
Chemical	77,500	69,200	900	2,700	1,100	3,600	149,000	128,300	7,200	6,700	1,900	4,900
Men	75,000	67,100	900	2,600	900	3,500	137,800	118,800	6,500	6,300	1,800	4,400
Women	2,500	2,100	[1]	100	200	100	11,200	9,500	800	400	100	400
Civil	188,200	88,800	5,500	21,300	50,800	21,800	346,300	215,000	10,500	32,800	76,200	11,800
Men	182,800	86,900	5,200	20,900	48,700	21,100	333,400	208,200	8,900	31,400	73,600	11,300
Women	5,400	1,900	300	400	2,000	800	12,900	6,800	1,700	1,400	2,600	400
Electrical/electronics	283,000	223,500	10,800	28,300	4,500	15,900	574,500	463,300	27,200	53,700	6,800	23,500
Men	281,400	222,400	10,700	28,300	4,500	15,500	555,500	448,100	25,900	52,300	6,600	22,600
Women	1,600	1,100	100	[1]	[1]	400	18,900	15,100	1,300	1,400	200	900
Industrial	[2]	[2]	[2]	[2]	[2]	[2]	137,700	121,100	4,700	6,000	2,100	3,800
Men	[2]	[2]	[2]	[2]	[2]	[2]	130,600	114,800	4,500	5,600	2,000	3,700
Women	[2]	[2]	[2]	[2]	[2]	[2]	7,100	6,300	200	400	[1]	200
Materials	[2]	[2]	[2]	[2]	[2]	[2]	53,100	45,200	4,000	2,200	300	1,400
Men	[2]	[2]	[2]	[2]	[2]	[2]	50,500	43,100	3,900	1,900	300	1,300
Women	[2]	[2]	[2]	[2]	[2]	[2]	2,500	2,100	100	200	[1]	100
Mechanical	276,200	230,400	8,700	15,400	3,200	18,500	492,600	426,100	18,300	30,000	4,600	13,600
Men	273,900	228,400	8,600	15,100	3,200	18,500	478,600	414,500	17,400	29,200	4,400	13,100
Women	2,300	1,900	100	300	[1]	[1]	14,000	11,600	900	800	200	500
Other engineers	490,000	374,000	11,900	29,600	14,900	59,600	576,400	460,900	25,200	37,100	23,500	29,700
Men	480,900	367,100	11,200	29,000	14,700	58,900	548,500	439,500	23,400	35,000	22,400	28,200
Women	9,100	6,900	600	700	200	700	28,100	21,600	1,500	2,100	1,200	1,700

[1]Too few cases to estimate.
[2]Detail unavailable.
[3]Includes nonprofit organizations, military, other, and no report.
NOTE: Because of rounding, detail may not add to totals.
SOURCE: National Science Foundation, SRS

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Table B-41. Employed scientists and engineers by field, sex, and primary work activity: 1976 and 1986

Field and sex	1976									
		Research and Development				Management, Administration				
	Total employed	Total	Basic research	Appld. research	Develop-ment	Total	Of R&D	Other than R&D	Teaching	Other[1]
Total, all fields	2,331,200	655,500	69,500	147,700	438,400	687,100	220,000	467,100	163,300	825,300
Men	2,131,600	606,200	55,400	127,800	423,000	652,900	209,500	443,300	131,800	740,700
Women	199,700	49,300	14,100	19,800	15,400	34,200	10,400	23,800	31,500	84,700
Total scientists	959,500	231,000	63,400	102,400	65,300	263,500	88,300	175,100	141,300	323,700
Men	781,300	191,500	50,000	84,800	56,600	232,600	79,700	152,800	109,900	247,300
Women	178,200	39,500	13,400	17,500	8,600	30,900	8,600	22,300	31,300	76,400
Physical scientists	188,900	77,600	20,000	33,400	24,200	50,700	29,900	20,800	22,700	37,900
Men	172,700	70,700	17,600	30,100	23,000	48,400	29,300	1,900	20,300	33,300
Women	16,200	6,800	2,400	3,300	1,200	2,300	600	1,700	2,300	4,800
Mathematical scientists	48,600	8,300	1,900	3,800	2,600	13,800	6,200	7,600	17,400	9,100
Men	37,100	6,400	1,900	2,900	1,600	12,200	4,900	7,300	12,500	6,000
Women	11,500	1,900	(3)	900	1,000	1,600	1,300	300	5,000	3,000
Computer specialists	119,000	27,500	400	1,500	25,600	24,800	8,200	16,600	3,800	62,900
Men	98,400	21,600	300	1,200	20,100	22,800	7,400	15,400	2,900	51,100
Women	20,600	5,900	100	300	5,500	2,000	900	1,200	900	11,800
Environmental scientists	54,800	22,900	6,500	12,900	3,600	14,900	6,500	8,400	3,100	13,900
Men	50,900	20,000	5,300	11,200	3,500	14,800	6,400	8,400	2,700	13,400
Women	3,900	2,900	1,200	1,700	100	200	200	(3)	400	400
Life scientists	213,500	64,800	26,300	31,400	7,100	62,300	18,600	43,700	29,300	57,100
Men	179,600	50,800	19,200	25,300	6,400	56,600	17,600	39,100	23,300	46,900
Women	33,900	14,000	7,100	6,100	800	5,700	1,100	4,600	6,000	8,200
Psychologists	112,500	7,900	3,200	3,600	1,200	22,000	4,600	17,400	21,600	61,000
Men	76,900	5,900	2,200	2,500	1,200	17,400	3,900	13,500	14,300	39,300
Women	35,600	2,000	1,000	1,000	(3)	4,600	700	3,900	7,400	21,600
Social Scientists	222,300	22,000	5,100	15,900	1,000	74,800	14,200	60,700	43,400	82,100
Men	165,700	15,900	3,500	11,600	900	60,400	10,300	50,100	34,000	55,400
Women	56,600	6,000	1,600	4,300	100	14,400	3,900	10,500	9,400	26,800
Total engineers	1,371,700	424,500	6,100	45,300	373,100	423,600	131,700	292,000	22,000	501,600
Men	1,350,300	414,700	5,400	43,000	366,400	420,300	129,800	290,500	21,900	493,400
Women	21,400	9,800	700	2,300	6,800	3,300	1,800	1,500	200	8,100
Aeronautical/astronautical	56,800	25,400	900	4,500	20,000	19,000	13,900	5,100	1,000	11,400
Men	56,400	25,000	900	4,400	19,700	19,000	13,900	5,100	1,000	11,400
Women	400	400	(3)	100	300	(3)	(3)	(3)	(3)	(3)
Chemical	77,500	28,400	200	4,200	24,000	28,600	8,600	20,000	600	19,900
Men	75,000	27,800	200	3,800	23,800	28,100	8,100	20,000	600	18,500
Women	2,500	500	(3)	300	200	500	500	(3)	(3)	1,500
Civil	188,200	34,400	300	3,100	31,000	64,800	6,000	58,800	2,300	86,700
Men	182,800	31,900	300	2,300	29,300	64,000	6,000	58,000	2,200	84,700
Women	5,400	2,500	(3)	800	1,700	800	(3)	800	100	2,000
Electrical/electronics	283,000	114,300	1,400	10,400	102,500	87,100	38,900	48,200	4,800	76,800
Men	281,400	113,700	1,400	10,400	101,900	86,900	38,700	48,200	4,800	76,000
Women	1,600	600	(3)	(3)	600	200	200	(3)	(3)	800
Industrial	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Men	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Women	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Materials	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Men	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Women	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mechanical	276,200	112,900	700	7,400	104,700	88,800	29,700	59,100	5,500	69,000
Men	273,900	112,100	700	7,400	104,100	87,900	28,700	59,100	5,500	68,400
Women	2,300	700	100	(3)	700	1,000	1,000	(3)	(3)	600
Other engineers	490,000	109,200	2,500	15,700	91,000	135,300	34,600	100,700	7,900	237,600
Men	480,900	104,200	1,800	14,700	87,700	134,500	34,400	100,100	7,900	234,300
Women	9,100	5,000	600	1,100	3,300	800	200	600	(3)	3,300

[1]Includes consulting; production/inspection; reporting/statistical work/computing; sales; professional services; other; and no report.
[2]Detail unavailable.
[3]Too few cases to estimate.

Table B-41. Employed scientists and engineers by field, sex, and primary work activity: 1976 and 1986—Con.

Field and sex	1986									
		Research and Development				Management, Administration				
	Total employed	Total	Basic research	Appld. research	Devel-opment	Total	Of R&D	Other than R&D	Teaching	Other[1]
Total, all fields	4,626,500	1,268,900	135,700	257,700	875,500	1,282,200	398,600	883,600	357,800	1,717,600
Men	3,927,800	1,116,700	102,700	211,700	802,300	1,148,300	367,200	781,100	276,300	1,386,500
Women	698,600	152,200	33,000	46,000	73,200	133,800	31,400	102,500	81,500	331,100
Total scientists	2,186,300	473,700	123,100	168,400	182,200	545,600	162,600	383,000	300,800	866,200
Men	1,586,700	362,600	91,600	129,700	141,300	424,900	135,500	289,400	223,300	575,900
Women	599,600	111,100	31,500	38,700	41,000	120,600	27,000	93,600	77,500	290,400
Physical scientists	288,400	115,200	28,000	42,500	44,700	73,400	43,000	30,500	45,800	54,000
Men	250,100	100,500	24,500	36,300	39,700	68,200	40,900	27,300	39,000	42,400
Women	38,300	14,700	3,500	6,200	5,100	5,200	2,100	3,100	6,800	11,600
Mathematical scientists	131,000	18,100	5,300	6,700	6,000	35,600	14,700	21,000	46,600	30,700
Men	97,100	15,200	5,000	5,400	4,700	28,400	12,200	16,300	33,800	19,700
Women	33,900	2,900	300	1,300	1,300	7,200	2,500	4,700	12,800	11,000
Computer specialists	562,600	112,800	4,200	10,900	97,800	86,800	32,800	54,000	19,600	343,400
Men	400,000	83,700	3,200	8,000	72,400	70,600	27,200	43,300	12,800	232,900
Women	162,500	29,200	1,000	2,800	25,400	16,200	5,600	10,600	6,800	110,300
Environmental scientists	111,300	36,400	10,000	19,900	6,400	21,800	7,500	14,300	9,200	43,900
Men	98,400	31,200	8,200	17,400	5,600	19,900	7,000	13,000	8,300	39,000
Women	12,900	5,100	1,800	2,600	800	1,900	500	1,400	900	5,000
Life scientists	411,800	128,400	57,600	55,100	15,700	110,200	30,100	80,100	61,500	111,700
Men	309,000	91,000	39,600	40,800	10,600	93,300	26,100	67,200	46,700	78,000
Women	120,800	37,400	18,000	14,300	5,100	16,900	4,000	13,000	14,700	51,800
Psychologists	253,500	20,600	7,900	9,500	3,200	65,900	9,500	56,500	39,100	127,900
Men	138,400	11,300	4,600	5,300	1,500	37,200	5,100	32,100	25,900	64,000
Women	115,200	9,300	3,300	4,300	1,700	28,700	4,300	24,400	13,200	64,000
Social Scientists	427,800	42,200	10,100	23,700	8,500	151,800	25,200	126,600	79,000	154,800
Men	293,800	29,700	6,400	16,500	6,700	107,300	17,100	90,200	56,800	100,000
Women	134,000	12,600	3,600	7,200	1,700	44,500	8,100	36,400	22,300	54,600
Total engineers	2,440,100	795,200	12,700	89,300	693,200	736,600	236,000	500,600	56,900	851,400
Men	2,341,100	754,100	11,100	82,000	661,000	723,400	231,700	491,700	53,000	810,600
Women	99,000	41,100	1,500	7,400	32,200	13,200	4,300	8,900	3,900	40,800
Aeronautical/astronautical	110,500	50,200	1,500	8,300	40,400	30,900	20,700	10,200	2,900	26,500
Men	106,200	47,800	900	7,500	39,300	30,500	20,600	9,900	2,600	25,300
Women	4,300	2,400	600	800	1,100	400	100	300	300	1,200
Chemical	149,000	51,300	1,200	7,300	42,800	50,500	18,400	32,100	3,500	43,700
Men	137,800	45,600	1,000	6,400	38,300	49,400	18,100	31,300	3,200	39,600
Women	11,200	5,600	200	900	4,500	1,000	300	700	300	4,300
Civil	346,300	53,000	900	6,600	45,500	126,600	10,700	115,900	6,800	159,900
Men	333,400	49,100	800	5,800	42,500	124,500	10,700	113,800	5,700	154,100
Women	12,900	3,900	100	800	3,000	2,100	100	2,100	1,100	5,800
Electrical/electronics	574,500	241,400	3,400	24,800	213,300	166,500	78,700	87,800	14,000	152,600
Men	555,500	231,300	3,200	23,400	204,600	164,000	77,400	86,500	13,000	147,200
Women	18,900	10,100	200	1,400	8,600	2,500	1,200	1,300	1,000	5,300
Industrial	137,700	25,700	200	900	24,600	47,400	8,100	39,300	3,500	61,100
Men	130,600	23,900	100	600	23,200	46,200	7,800	38,400	3,400	57,100
Women	7,100	1,700	100	200	1,400	1,200	300	900	100	4,100
Materials	53,100	20,600	1,300	4,200	15,100	15,400	5,800	9,600	1,600	15,500
Men	50,500	19,400	1,200	3,900	14,300	15,100	5,600	9,400	1,600	14,400
Women	2,500	1,100	(3)	300	800	300	100	200	(3)	1,100
Mechanical	492,600	207,100	2,400	14,600	190,000	149,000	51,700	97,900	9,300	127,200
Men	478,600	199,900	2,300	13,600	184,000	148,000	51,100	96,800	9,100	121,600
Women	14,000	7,200	200	1,000	6,000	1,600	600	1,000	200	5,000
Other engineers	576,400	145,900	1,800	22,600	121,500	150,300	41,900	107,800	15,300	264,900
Men	548,500	137,100	1,600	20,800	114,800	145,700	40,400	105,600	14,400	251,300
Women	28,100	9,100	100	2,000	6,800	4,100	1,600	2,400	900	14,000

NOTE: Because of rounding, detail may not add to totals.
SOURCE: National Science Foundation, SRS

Table B-42. Scientists and engineers by field, racial/ethnic group, and employment status: 1976 and 1986

Field and racial/ethnic group	1976					1986				
	Total population	Total employed	Employed in science/ engineering	Unemployed, seeking	Outside the labor force	Total population	Total employed	Employed in science/ engineering	Unemployed, seeking	Outside the labor force
Total, all fields[1]	2,530,100	2,331,200	2,122,100	82,100	116,800	4,971,900	4,626,500	3,919,900	72,700	272,700
White	2,328,100	2,141,900	1,949,700	73,300	112,900	4,508,600	4,190,400	3,556,200	61,700	256,500
Black	42,000	38,100	34,900	2,400	1,600	122,900	114,900	87,900	4,500	3,400
Asian	109,900	106,600	98,500	1,600	1,600	239,700	226,800	199,000	4,200	8,800
Total scientists	1,048,400	959,500	843,800	36,500	52,400	2,337,000	2,186,300	1,676,400	41,900	108,700
White	954,400	870,900	764,200	33,500	49,900	2,109,700	1,973,100	1,521,000	35,800	100,800
Black	23,900	21,400	19,400	1,300	1,400	78,900	73,700	50,600	2,800	2,400
Asian	49,700	48,500	43,100	600	500	100,100	94,000	72,300	2,200	3,900
Physical scientists	203,900	188,900	154,900	5,900	9,100	312,600	288,400	264,900	4,200	20,000
White	186,100	172,400	141,200	5,300	8,300	283,800	261,800	240,400	3,700	18,300
Black	3,400	3,200	2,400	200	[2]	6,500	6,200	5,400	200	100
Asian	8,200	7,600	6,400	400	100	16,700	15,400	14,500	200	1,200
Mathematical scientists	55,000	48,600	43,800	2,500	3,800	140,300	131,000	103,900	1,700	7,500
White	50,400	44,200	39,400	2,500	3,600	124,200	115,500	91,300	1,500	7,200
Black	2,700	2,600	2,500	[2]	200	7,000	6,800	6,100	100	100
Asian	1,700	1,600	1,700	[2]	[2]	6,200	5,900	4,200	100	100
Computer specialists	125,900	119,000	116,000	3,000	3,900	575,800	562,600	437,200	4,800	8,400
White	116,800	110,700	108,000	2,400	3,800	508,500	497,100	388,200	4,200	7,200
Black	2,300	1,600	1,500	600	100	19,300	18,900	13,200	200	200
Asian	4,000	4,000	3,900	[2]	100	37,200	36,100	27,600	200	900
Environmental scientists	58,300	54,800	46,600	1,200	2,300	123,200	111,300	97,300	5,100	6,800
White	51,600	48,300	40,700	900	2,300	117,400	105,800	93,600	5,000	6,600
Black	2,100	2,000	1,800	[2]	[2]	1,000	1,000	400	[2]	[2]
Asian	3,400	3,200	2,900	200	[2]	2,300	2,100	1,900	100	100
Life scientists	203,700	213,500	198,200	6,300	10,900	452,100	411,800	340,500	8,800	31,500
White	217,500	200,700	186,100	6,200	10,600	415,800	377,900	313,100	8,000	29,900
Black	4,900	4,900	4,700	[2]	[2]	9,300	8,800	7,100	300	100
Asian	5,600	5,300	5,400	[2]	200	16,400	15,000	12,900	400	1,000
Psychologists	122,500	112,500	103,700	5,700	4,300	273,600	253,500	172,800	6,600	13,500
White	114,100	105,100	97,100	4,700	4,300	252,300	234,100	161,800	5,600	12,600
Black	3,800	3,800	3,700	[2]	[2]	10,000	9,100	6,000	300	500
Asian	1,000	1,000	700	[2]	[2]	5,400	5,200	1,400	200	100
Social scientists	252,200	222,300	180,500	11,900	18,100	459,400	427,800	259,800	10,600	21,000
White	217,800	189,400	151,600	11,500	17,000	407,700	380,800	232,600	7,800	19,000
Black	4,700	3,300	2,900	400	1,000	25,900	22,900	12,300	1,700	1,300
Asian	25,900	25,800	22,100	[2]	100	15,800	14,200	9,700	1,000	600
Total engineers	1,481,700	1,371,700	1,278,300	45,600	64,400	2,634,900	2,440,100	2,243,500	30,800	164,000
White	1,373,700	1,271,000	1,185,500	39,800	63,000	2,398,900	2,217,300	2,035,200	25,900	155,700
Black	18,100	16,700	15,500	1,100	200	44,000	41,300	37,300	1,700	1,000
Asian	60,200	58,100	55,400	1,000	1,100	139,700	132,800	126,700	2,000	4,900

[1]Because totals include other and no report, detail may not add to totals.
[2]Too few cases to estimate.

SOURCE: National Science Foundation, SRS

Table B-43. Hispanic scientists and engineers by employment status and field: 1986[3]

Field	Total population	Total employed	Employed in S/E	Unemployed, seeking	Outside the labor force
Total, all fields[2]	100,100	93,400	74,900	2,000	4,800
Total scientists	50,100	46,100	31,200	1,400	2,600
Physical scientists	5,200	4,800	4,600	200	300
Mathematical scientists	3,200	3,100	2,600	[3]	100
Computer specialists	9,700	9,300	6,100	100	400
Environmental scientists	2,000	1,800	1,600	100	100
Life scientists	10,800	9,900	7,100	100	800
Psychologists	6,400	5,900	2,700	300	200
Social scientists	12,700	11,400	6,600	700	600
Total engineers	50,000	47,200	43,700	600	2,200

[1]Includes members of all racial groups.
[2]Totals include other and no report.
[3]Too few cases to estimate.

NOTE: Because of rounding, detail may not add to totals.
SOURCE: National Science Foundation, SRS

Table B-44. Selected characteristics of employed doctoral scientists and engineers in the United States: 1975 and 1985

Characteristics	1975			1985		
	Number	Percent	Median annual salary	Number	Percent	Median annual salary
Total	255,940	100.0	23,200	400,358	100.0	44,800
Field:						
Scientists	213,507	83.4	22,600	334,505	83.6	42,500
Physical scientists	54,629	21.3	23,900	67,480	16.9	47,000
Chemists	35,825	14.0	24,000	43,735	10.9	46,000
Physicists/astronomers	18,804	7.3	23,700	23,745	5.9	48,400
Mathematical scientists	13,611	5.3	21,200	16,758	4.2	42,100
Mathematicians	11,864	4.6	20,900	13,957	3.5	41,800
Statisticians	1,747	.7	23,100	2,801	.7	43,700
Computer/information specialists	3,528	1.4	23,400	14,964	3.7	46,000
Environmental scientists	12,103	4.7	23,500	17,288	4.3	46,600
Earth Scientists	9,500	3.7	23,600	13,202	3.3	47,500
Oceanographers	1,277	.5	22,100	1,959	.5	42,300
Atmospheric scientists	1,326	.5	24,200	2,127	.5	47,300
Life scientists	63,344	24.7	22,200	101,838	25.4	41,700
Biological scientists	39,036	15.3	21,300	59,871	15.0	40,500
Agricultural scientists	10,993	4.3	21,800	15,513	3.9	41,200
Medical scientists	13,315	5.2	25,700	26,454	6.6	45,900
Psychologists	30,001	11.7	22,100	52,182	13.0	39,500
Social scientists	36,291	14.2	22,200	63,995	16.0	40,500
Economists	11,814	4.6	24,400	17,925	4.5	46,100
Sociologists/anthropologists	7,910	3.1	20,600	12,692	3.2	37,200
Other social scientists	16,567	6.5	21,100	33,378	8.3	38,300
Engineers	42,433	16.6	25,200	65,853	16.4	52,400
Aeronautical/astronautical engineers	2,019	.8	25,200	3,827	1.0	53,800
Chemical engineers	5,368	2.1	26,400	7,122	1.8	55,700
Civil engineers	3,772	1.5	22,900	6,396	1.6	48,500
Electrical/electronics engineers	8,538	3.3	25,000	14,248	3.6	55,100
Mechanical engineers	4,033	1.6	23,800	6,594	1.6	51,100
Nuclear engineers	1,680	.7	25,500	2,377	.6	54,200
Other engineers	17,023	6.7	25,700	25,289	6.3	52,100
Sex:						
Men	233,877	91.4	23,500	341,873	85.4	46,000
Women	22,063	8.6	19,100	58,485	14.6	35,500
Race:						
White	232,777	90.9	23,300	355,125	88.7	44,800
Black	2,513	1.0	22,800	5,716	1.4	40,100
Asian	13,559	5.3	21,500	34,533	8.6	45,500
American Indian/Alaskan native	211	.1	19,100	511	.1	42,100
Other	243	.1	20,600	300	.1	40,300
No report	6,637	2.6	23,600	4,173	1.0	45,400
Ethnicity:						
Hispanic	2,033	.8	22,500	5,897	1.5	42,200
Nonhispanic	110,013	43.0	23,000	365,493	91.3	44,800
No report	143,894	56.2	23,300	28,968	7.2	45,000

Table B-44. Selected characteristics of employed doctoral scientists and engineers in the United States: 1975 and 1985—Con.

Characteristics	1975			1985		
	Number	Percent	Median annual salary	Number	Percent	Median annual salary
Age:						
Under 30	9,540	3.7	16,900	5,985	1.5	34,800
30–34	55,169	21.6	18,800	48,538	12.1	35,800
35–39	53,523	20.9	21,500	78,230	19.5	39,200
40–44	40,085	15.7	24,200	86,074	21.5	45,100
45–49	33,575	13.1	26,200	62,643	15.6	48,400
50–54	28,709	11.2	28,100	43,507	10.9	50,200
55–59	18,405	7.2	28,100	34,354	8.6	51,400
60–64	11,248	4.4	28,600	26,277	6.6	51,900
65 and over	5,492	2.1	27,600	14,560	3.6	51,700
No report	194	.1	24,100	190	(1)	(2)
Type of employment:						
Science/engineering	240,223	93.9	23,100	365,361	91.3	44,500
Other/unknown field	15,717	6.1	24,300	34,997	8.7	48,200
Sector of employment:						
Business/industry	64,621	25.2	26,000	125,767	31.4	52,000
Educational institutions	149,076	58.2	21,400	211,611	52.9	40,600
4-year colleges/universities	143,615	56.1	21,500	202,019	50.5	40,800
2-year colleges	3,567	1.4	19,100	6,001	1.5	36,100
Elementary/secondary schools	1,894	.7	20,400	3,591	.9	36,300
Hospitals/clinics	7,482	2.9	21,800	11,352	2.8	37,800
Non-profit organizations	8,334	3.3	24,400	13,617	3.4	43,900
Federal Government	18,996	7.4	26,300	26,337	6.6	48,400
Military/Comm. Corps	2,130	.8	(2)	1,875	.5	(2)
State government	3,015	1.2	20,900	5,878	1.5	36,100
Other government	1,878	.7	22,900	2,339	.6	35,400
Other	82	(1)	(2)	1,213	.3	76,000
No report	326	.1	(2)	369	.1	(2)
Primary work activity:						
Research and development	82,371	32.2	23,000	132,515	33.1	45,400
Basic research	38,137	14.9	22,200	61,451	15.3	42,400
Applied research	32,903	12.9	23,400	49,088	12.3	46,000
Development/design	11,331	4.4	23,600	21,976	5.5	48,300
Management/administration	51,737	20.2	29,600	69,632	17.4	55,700
Of R&D	28,657	11.2	30,100	34,938	8.7	60,300
Of other	23,080	9.0	28,600	34,694	8.7	50,900
Teaching	91,101	35.6	20,600	111,717	27.9	39,200
Consulting	5,516	2.2	25,500	14,164	3.5	50,600
Sales/professional services	11,660	4.6	21,900	36,496	9.1	42,500
Other	7,482	2.9	22,100	24,761	6.2	45,200
No report	6,073	2.4	23,700	11,073	2.8	44,500

[1]Less than .05 percent.
[2]No median computed for groups with fewer than 20 individuals reporting salary.
NOTE: Because of rounding, percents may not add to 100. Median salaries computed for full-time employed civilians only.
SOURCE: National Science Foundation, SRS

Table B-45. Selected characteristics of employed women doctoral scientists and engineers in the United States: 1975 and 1985

Characteristics	1975				1985			
	Number	Percent	Percent of total employed	Median annual salary	Number	Percent	Percent of total employed	Median annual salary
Total	22,063	100.0	8.6	19,100	58,485	100.0	14.6	35,500
Field:								
Scientists	21,830	98.9	10.2	19,000	56,997	97.5	17.0	35,300
Physical scientists	2,539	11.5	4.6	19,100	4,671	8.0	6.9	38,600
Chemists	2,065	9.4	5.8	19,100	3,805	6.5	8.7	38,200
Physicists/astronomers	474	2.1	2.5	19,400	866	1.5	3.6	41,200
Mathematical scientists	906	4.1	6.7	18,400	1,559	2.7	9.3	35,400
Mathematicians	821	3.7	6.9	18,200	1,233	2.1	8.8	34,700
Statisticians	85	.4	4.9	21,700	326	.6	11.6	36,600
Computer/information specialists	148	.7	4.2	18,000	1,619	2.8	10.8	38,600
Environmental scientists	325	1.5	2.7	19,100	1,089	1.9	6.3	38,700
Earth Scientists	242	1.1	2.5	18,200	760	1.3	5.8	39,200
Oceanographers	51	.2	4.0	(2)	247	.4	12.6	36,900
Atmospheric scientists	32	.1	2.4	(2)	82	.1	3.9	39,100
Life scientists	7,533	34.1	11.9	19,000	19,692	33.7	19.3	35,100
Biological scientists	5,780	26.2	14.8	18,500	12,637	21.6	21.1	34,500
Agricultural scientists	148	.7	1.3	20,200	829	1.4	5.3	31,900
Medical scientists	1,605	7.3	12.1	20,600	6,226	10.6	23.5	36,200
Psychologists	6,305	28.6	21.0	19,600	16,609	28.4	31.8	34,800
Social scientists	4,074	18.5	11.2	18,700	11,758	20.1	18.4	34,600
Economists	635	2.9	5.4	21,000	1,709	2.9	9.5	38,300
Sociologists/anthropologists	1,656	7.5	20.9	18,400	3,625	6.2	28.6	34,200
Other social scientists	1,783	8.1	10.8	18,200	6,424	11.0	19.2	33,700
Engineers	233	1.1	.5	21,200	1,488	2.5	2.3	43,900
Aeronautical/astronautical engineers	16	.1	.8	(2)	95	.2	2.5	44,500
Chemical engineers	23	.1	.4	(2)	101	.2	1.4	43,500
Civil engineers	5	(1)	.1	(2)	91	.2	1.4	37,000
Electrical/electronics engineers	45	.2	.5	(2)	347	.6	2.4	45,600
Mechanical engineers	9	(1)	.2	(2)	58	.1	.9	42,000
Nuclear engineers	10	(1)	.6	(2)	32	.1	1.3	(2)
Other engineers	125	.6	.7	22,200	764	1.3	3.0	44,000
Race:								
White	20,129	91.2	8.6	19,000	52,035	89.0	14.7	35,500
Black	422	1.9	16.8	20,400	1,707	2.9	29.9	34,500
Asian	1,134	5.1	8.4	18,900	4,129	7.1	12.0	36,800
American Indian/Alaskian native	11	(1)	5.2	(2)	63	.1	12.3	(2)
Other	37	.2	15.2	(2)	76	.1	25.3	(2)
No report	330	1.5	5.0	20,300	475	.8	11.4	35,000
Ethnicity:								
Hispanic	215	1.0	10.6	19,700	951	1.6	16.1	34,900
Nonhispanic	15,574	70.6	14.2	19,100	53,937	92.2	14.8	35,500
No report	6,274	28.4	4.4	18,900	3,597	6.2	12.4	36,300

Table B-45. Selected characteristics of employed women doctoral scientists and engineers in the United States: 1975 and 1985—Con.

Characteristics	1975				1985			
	Number	Percent	Percent of total employed	Median annual salary	Number	Percent	Percent of total employed	Median annual salary
Age:								
Under 30	1,535	7.0	16.1	15,900	1,427	2.4	23.8	30,900
30–34	4,973	22.5	9.0	16,800	11,345	19.4	23.4	30,900
35–39	4,081	18.5	7.6	18,300	14,525	24.8	18.6	34,200
40–44	2,810	12.7	7.0	20,000	11,813	20.2	13.7	36,200
45–49	2,887	13.1	8.6	21,500	7,143	12.2	11.4	38,300
50–54	2,416	11.0	8.4	22,400	4,475	7.7	10.3	39,000
55–59	1,460	6.6	7.9	21,700	3,523	6.0	10.3	40,700
60–64	1,160	5.3	10.3	22,600	2,529	4.3	9.6	42,400
65 and over	714	3.2	13.0	22,300	1,647	2.8	11.3	42,300
No report	27	.1	13.9	(2)	58	.1	30.5	(2)
Type of employment:								
Science/engineering	20,503	92.9	8.5	19,000	52,494	89.8	14.4	35,500
Other/unknown field	1,560	7.1	9.9	19,600	5,991	10.2	17.1	35,700
Sector of employment:								
Business/industry	2,139	9.7	3.3	22,200	12,945	22.1	10.3	42,400
Educational institutions	15,488	70.2	10.4	18,500	34,338	58.7	16.2	33,900
4-year colleges/universities	14,198	64.4	9.9	18,400	31,681	54.2	15.7	33,800
2-year colleges	701	3.2	19.7	18,700	1,305	2.2	21.7	36,700
Elementary/secondary schools	589	2.7	31.1	20,700	1,352	2.3	37.6	35,900
Hospitals/clinics	1,750	7.9	23.4	19,500	3,393	5.8	29.9	33,400
Non-profit organizations	914	4.1	11.0	19,600	3,184	5.4	23.4	31,600
Federal Government	1,033	4.7	5.4	24,700	2,694	4.6	10.2	40,900
Military/Comm. Corps	39	.2	1.8	(2)	93	.2	5.0	(2)
State government	393	1.8	13.0	19,800	1,111	1.9	18.9	33,300
Other government	233	1.1	12.4	20,000	513	.9	21.9	31,700
Other	15	.1	18.3	(2)	147	.3	12.1	42,400
No report	59	.3	18.1	(2)	87	.1	18.2	(2)
Primary work activity:								
Research and development	5,998	27.2	7.3	19,100	16,463	28.1	12.4	38,200
Basic research	4,450	20.2	11.7	18,400	10,110	17.3	16.5	35,000
Applied research	1,323	6.0	4.0	20,400	4,934	8.4	10.1	38,000
Development/design	225	1.0	2.0	19,300	1,419	2.4	6.5	39,600
Management/administration	2,432	11.0	4.7	23,100	7,083	12.1	10.2	42,300
Of R&D	893	4.0	3.1	24,700	2,108	3.6	6.0	47,500
Of other	1,539	7.0	6.7	22,400	4,975	8.5	14.3	40,500
Teaching	9,441	42.8	10.4	18,200	17,620	30.1	15.8	33,200
Consulting	398	1.8	7.2	20,700	1,434	2.5	10.1	38,900
Sales/professional services	2,353	10.7	20.2	20,000	9,791	16.7	26.8	35,500
Other	822	3.7	11.0	18,400	4,054	6.9	16.4	35,400
No report	619	2.8	10.2	20,600	2,040	3.5	18.4	37,100

[1]Less than .05 percent.
[2]No median computed for groups with fewer than 20 individuals reporting salary.
NOTE: Because of rounding, percents may not add to 100. Median salaries computed for full-time employed civilians only.
SOURCE: National Science Foundation, SRS

Table B-46. Total and foreign full-time graduate enrollment in science/engineering doctoral-granting institutions: 1976 and 1986

Selected field	1976			1986		
	Total	Foreign	Percent	Total	Foreign	Percent
Total science/engineering	214,089	34,400	16.1%	259,980	72,809	28.0%
Total, science	173,575	21,174	12.2	200,055	46,482	23.1
Biological	35,624	3,532	9.9	36,916	7,003	19.0
Computer	4,283	1,005	23.5	13,504	5,439	40.3
Earth, environmental, marine	9,668	977	10.1	10,909	1,798	16.5
Mathematical	10,281	2,179	21.2	11,767	4,962	42.2
Physical	21,590	4,428	20.5	27,074	9,152	33.8
Social	48,651	6,302	13.0	47,589	11,666	24.5
Other	43,478	2,751	6.3	52,296	6,162	11.8
Total, engineering	36,231	12,221	33.7	59,925	26,627	44.4
Chemical	3,657	1,537	42.0	5,542	2,155	38.9
Civil	6,892	1,986	28.8	10,128	4,694	46.3
Electrical	8,063	2,719	33.7	15,851	7,455	47.0
Industrial	3,475	1,037	29.8	4,527	1,952	43.1
Mechanical	4,861	1,791	36.8	9,485	4,459	47.0
Other	9,283	3,151	33.9	14,392	5,912	41.1

SOURCE: National Science Foundation, SRS

Table B-47. Bachelor's and first-professional degrees awarded by field: 1960–86

Year	All fields	Science/engineering fields						All other fields[4]
		Total	Physical sciences[1]	Engineering	Mathematical sciences[2]	Life sciences	Social sciences[3]	
	Number							
1960	394,889	120,937	16,057	37,808	11,437	24,141	31,494	273,952
1961	401,784	121,660	15,500	35,866	13,127	23,900	83,267	280,124
1962	420,485	127,469	15,894	34,735	14,610	25,200	37,030	293,016
1963	450,592	135,964	16,276	33,458	16,128	27,801	42,308	314,628
1964	502,104	153,361	17,527	35,226	18,677	31,611	50,320	348,743
1965	538,930	164,936	17,916	36,795	19,668	34,842	55,715	373,994
1966	555,613	173,471	17,186	35,815	20,182	36,964	63,424	382,142
1967	594,862	187,849	17,794	36,188	21,530	39,408	72,929	407,013
1968	671,591	212,174	19,442	37,614	24,084	43,260	87,774	459,417
1969	769,683	244,519	21,591	41,553	28,263	48,713	104,399	525,164
1970	833,322	264,122	21,551	44,772	29,109	52,129	116,561	569,200
1971	884,386	271,176	21,549	45,387	27,306	51,461	125,473	613,210
1972	937,884	281,228	20,887	46,003	27,250	51,484	133,604	656,656
1973	980,707	295,391	20,809	46,989	27,528	59,486	140,579	685,316
1974	1,008,654	305,062	21,287	43,530	26,570	68,226	145,449	703,592
1975	987,922	294,920	20,896	40,065	23,385	72,710	137,864	693,002
1976	997,504	292,174	21,559	39,114	21,749	77,301	132,451	705,330
1977	993,008	288,543	22,618	41,581	20,729	78,472	125,143	704,465
1978	997,165	288,167	23,175	47,411	19,925	77,138	120,518	708,998
1979	1,000,562	288,625	23,363	53,720	20,670	75,085	115,787	711,937
1980	1,010,777	291,983	23,661	59,240	22,686	71,617	114,779	718,794
1981	1,019,646	294,867	24,175	64,068	26,406	68,086	112,132	724,379
1982	1,036,597	302,118	24,372	67,791	32,139	65,041	112,775	734,479
1983	1,054,242	307,225	23,497	72,954	37,235	63,237	110,302	747,017
1984	1,061,245	314,666	23,759	76,531	45,777	59,613	108,986	746,759
1985	1,066,439	321,739	23,847	77,871	54,388	57,812	107,821	744,700
1986	1,074,785	323,950	21,862	77,061	58,583	56,465	109,979	750,835

[1]Includes environmental sciences.
[2]Includes statistics and computer science.
[3]Excludes history and includes psychology.
[4]Includes first-professional degrees such as M.D., D.D.S., D.V.M., and J. D. degrees.
SOURCE: National Science Foundation, SRS

Table B-48. Master's degrees awarded by field: 1960–86

Year	All fields	Science/engineering fields						All other fields
		Total	Physical sciences[1]	Engineering	Mathematics/ computer sciences[2]	Life sciences	Social sciences[3]	
	Number							
1960	74,497	20,012	3,387	7,159	1,765	3,751	3,950	54,485
1961	78,269	22,786	3,799	8,178	2,238	4,085	4,486	55,483
1962	84,889	25,146	3,929	8,909	2,680	4,672	4,956	59,743
1963	91,418	27,367	4,132	9,635	3,323	4,718	5,559	64,051
1964	101,122	30,271	4,567	10,827	3,603	5,357	5,917	70,851
1965	112,195	33,835	4,918	12,056	4,294	5,978	6,589	78,360
1966	140,772	38,083	4,992	13,678	5,010	6,666	7,737	102,689
1967	157,892	41,800	5,412	13,885	5,733	7,465	9,305	116,092
1968	177,150	45,425	5,508	15,188	6,081	8,315	10,333	131,725
1969	194,414	48,425	5,911	15,243	6,735	8,809	11,727	145,989
1970	209,387	49,318	5,948	15,597	7,107	8,590	12,076	160,069
1971	231,486	50,624	6,386	16,347	6,789	8,320	12,782	180,862
1972	252,774	53,567	6,307	16,802	7,186	8,914	14,358	199,207
1973	264,525	54,234	6,274	16,758	7,146	9,080	14,976	210,291
1974	278,259	54,175	6,087	15,393	7,116	9,605	15,974	224,084
1975	293,651	53,852	5,830	15,434	6,637	9,618	16,333	239,799
1976	313,001	54,747	5,485	16,170	6,466	9,823	16,803	258,254
1977	318,241	56,731	5,345	16,889	6,496	10,707	17,294	261,510
1978	312,816	56,237	5,576	17,105	6,421	10,711	16,514	256,579
1979	302,075	54,456	5,464	16,193	6,101	10,719	15,979	247,619
1980	299,095	54,391	5,233	16,846	6,515	10,278	15,519	244,704
1981	296,798	54,811	5,300	17,373	6,787	9,731	15,620	241,987
1982	296,580	57,025	5,526	18,594	7,666	9,824	15,415	239,555
1983	290,931	58,868	5,288	19,721	8,160	9,720	15,979	232,063
1984	285,462	59,569	5,568	20,352	8,939	9,330	15,380	225,893
1985	287,213	61,278	5,802	21,206	9,989	8,757	15,524	225,935
1986	289,829	62,526	5,910	21,314	11,241	8,572	15,489	227,303

[1]Includes environmental sciences.
[2]Includes statistics.
[3]Excludes history and includes psychology.
SOURCE: National Science Foundation, SRS

Table B-49. Doctorate degrees awarded by field: 1960–86

Year	All fields	Science/engineering fields						All other fields
		Total	Physical sciences[1]	Engineering	Mathematics/ computer sciences[2]	Life sciences	Social sciences[3]	
	Number							
1960	9,733	6,263	1,861	794	291	1,660	1,657	3,470
1961	10,413	6,721	1,993	940	332	1,682	1,774	3,692
1962	11,500	7,438	2,097	1,216	388	1,867	1,870	4,062
1963	12,728	8,219	2,427	1,357	483	1,976	1,976	4,509
1964	14,325	9,224	2,527	1,664	588	2,219	2,226	5,101
1965	16,340	10,476	2,865	2,074	685	2,539	2,313	5,864
1966	17,949	11,458	3,059	2,301	769	2,711	2,618	6,491
1967	20,403	12,982	3,503	2,604	830	2,966	3,079	7,421
1968	22,936	14,448	3,681	2,855	971	3,511	3,430	8,488
1969	25,743	16,039	3,935	3,265	1,070	3,815	3,954	9,704
1970	29,498	17,743	4,403	3,434	1,225	4,165	4,516	11,755
1971	31,867	18,949	4,501	3,498	1,238	4,557	5,155	12,918
1972	33,041	19,007	4,257	3,503	1,281	4,454	5,512	14,034
1973	33,755	19,001	4,078	3,364	1,233	4,503	5,823	14,754
1974	33,047	18,313	3,765	3,147	1,211	4,304	5,886	14,734
1975	32,951	18,358	3,710	3,002	1,147	4,402	6,097	14,593
1976	32,946	17,864	3,506	2,834	1,003	4,361	6,160	15,082
1977	31,716	17,417	3,415	2,643	964	4,266	6,129	14,299
1978	30,875	17,048	3,234	2,423	959	4,369	6,063	13,827
1979	31,237	17,245	3,320	2,490	979	4,501	5,955	13,992
1980	31,017	17,199	3,149	2,479	962	4,715	5,894	13,818
1981	31,353	17,633	3,210	2,528	960	4,786	6,149	13,720
1982	31,096	17,625	3,351	2,646	940	4,840	5,848	13,471
1983	31,216	17,931	3,439	2,781	987	4,749	5,975	13,285
1984	31,277	18,075	3,459	2,913	993	4,872	5,838	13,202
1985	31,211	18,261	3,534	3,167	998	4,882	5,680	12,950
1986	31,770	18,792	3,679	3,376	1,129	4,790	5,818	12,978

[1]Includes evironmental sciences.
[2]Includes statistics.
[3]Excludes history and including psychology.
SOURCE: National Science Foundation, SRS

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